④

**U.S. Department
of Transportation

United States
Coast Guard**

AD-A219 304

BTOS DATABASE
EVALUATION

DTIC
ELECTE
S MAR 1 5 1990 D
D ᥴ

FINAL REPORT

REPORT DOCUMENTATION PAGE

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

| 1. AGENCY USE ONLY (Leave blank) | 2. REPORT DATE
0 6 MAR 1990 | 3. REPORT TYPE AND DATES COVERED
Evaluation Report |
|---|---|---|

4. TITLE AND SUBTITLE

BTOS DATABASE EVALUATION

5. FUNDING NUMBERS

6. AUTHOR(S)

LT Jon D. Allen

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

Commanding Officer
U. S. Coast Guard Information Systems Center
7323 Telegraph Road
Alexandria, VA 22310-3999

8. PERFORMING ORGANIZATION REPORT NUMBER

CGISC-5232-90-01

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Commanding Officer
U. S. Coast Guard Information Systems Center
7323 Telegraph Road
Alexandria, VA 22310-3999

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

CGISC-5232-90-01

11. SUPPLEMENTARY NOTES

None

12a. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release;
distribution is unlimited.

12b. DISTRIBUTION CODE

N/A

13. ABSTRACT (Maximum 200 words)

The objective of the Coast Guard Information Systems Center's study was to evaluate databases in the BTOS environment. This report gives the results of the evaluation from an end-user's point of view. The products evaluated were: ADS, Fasport-dbm, Forms Plus, INFORMIX-SQL, Intelligent Query, Oracle, Paradise, PDS-Adept, PRESTO/REPORTER, PROGRESS, R:BASE 5000, reQuest and reQuest II.

This report includes: product descriptions, test conditions and environment, results of the performance tests, a subjective evaluation of the major characteristics of each product, and a tabular outline of functional capabilities for each database package.

14. SUBJECT TERMS

Coast Guard, BTOS, Database, Evaluation,

15. NUMBER OF PAGES
212

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
unclassified	unclassified	unclassified	unlimited

(THIS PAGE LEFT INTENTIONALLY BLANK)

FINAL REPORT

BTOS DATABASE EVALUATION

Center Project Manager: LT Jon D. Allen

United States Coast Guard
Information Systems Center
7323 Telegraph Road
Alexandria, VA 22310-3999

QUALITY
INSPECTED
4

Approved: _____

Executive Director

March 6, 1990

Date

(THIS PAGE LEFT INTENTIONALLY BLANK)

EXECUTIVE SUMMARY

The information contained in this comparative study is intended for Coast Guard internal use only. Unauthorized use of the data by vendors for purposes of product endorsement is prohibited.

The objective of the Coast Guard Information Systems Center's study was to evaluate databases in the BTOS environment. This report gives the results of the evaluation from an end-user's point of view. The products evaluated were: ADS, Fasport-dbm, Forms Plus, INFORMIX-SQL, Intelligent Query, Oracle, Paradise, PDS-Adept, PRESTO/REPORTER, PROGRESS, R:BASE 5000, reQuest and reQuest II.

This report includes: product descriptions, test conditions and environment, results of the performance tests, a subjective evaluation of the major characteristics of each product, and a tabular outline of functional capabilities for each database package.

PERFORMANCE TESTS:

Performance tests included timings of the speed of: data import, data manipulation, query execution and report generations. The Coast Guard supplied the data used for each test. Product performance results are presented in Section 3-B.

SUBJECTIVE EVALUATION:

Characteristics rated in the subjective evaluation included: documentation, query capability, report capability, general ease of use and hotline response. These ratings ranged from 0 (poor) to 5 (excellent). Subjective evaluations are presented for each product and can be found in Section 3-C.

FUNCTIONAL CAPABILITIES:

Vendors provided extensive information on the functional capabilities of their product. Categories included: program type, program environment, file structure limits, data field types (max sizes), data field attributes, data import/export, data manipulation, sorting, search parameters, browsing, query facilities, mathematical functions, statistics, command strategy, macros, input facilities, output facilities, security, special features, user support, interfaces to other applications and required CTOS/BTOS environment. Functional capabilities tables are located in Appendix B.

BTOS DATABASE EVALUATION

TABLE OF CONTENTS

SECTION 1
INTRODUCTION

BACKGROUND:

The "database bakeoff" is Phase I of a three phased effort to evaluate database products for ongoing development efforts and future growth in the Coast Guard. The idea originated at the 1988 Coast Guard Information Resource Manager's (IRM) Conference in Annapolis, MD. Representatives from the Information Systems Center (ISC), Alexandria, VA; the Electronics Engineering Center (EECEN), Wildwood, NJ; and the Research and Development Center (RDC), Groton, CT further defined the concept at a Tri-lab conference held later that year.

This report documents ISC's evaluation of BTOS database products from an end-user's point of view. In addition to performance, evaluators subjectively rated the products on overall ease of use, capabilities, and support. The objective of this particular test series was to determine the effectiveness of each database product in the hands of a relatively inexperienced end-user.

In Phase II, EECEN evaluated the ease and effectiveness of porting a portion of a Mission Critical Software application, PROPERTY, to "big boy" database products running on the Standard Workstation. Products which had come to BTOS by way of the UNIX operating system were considered the "big boys". EECEN's findings are included as Appendix D.

Phase III will be a literature search of database products running in the UNIX environment. Development efforts and compatibility with existing systems will be affected by the Coast Guard's desire for POSIX compliance in the future.

THE BAKEOFF:

ISC tasked the Transportation Systems Center (TSC), in Cambridge, MA, to assist in the evaluation of database software products for end-user applications on the Standard Workstation.

In response to a letter from ISC, vendors desiring to participate in the study provided a copy of their product for evaluation. The following products were evaluated:

      o   Application Development System (ADS)   Version 5.0

      o   Fasport-dbm   Version 5.1

      o   Forms Plus Laser   Version 3.5

      o   INFORMIX-SQL   Version 2.10.00B

      o   Intelligent Query   Version 1.20M

o	Oracle (Oracle Corporation)	Version 5.1.22
o	Oracle (Unisys Corporation)	Version 1.1
o	Paradise	Version 2.2
o	PDS-Adept & PDS-Query	Version 2.6.0
o	PRESTO/REPORTER	Version 2.0
o	PROGRESS & PROGRESS FAST TRACK	Version 5.2.D
o	R:BASE 5000	Version 1.10
o	reQuest	Version 6.1
o	reQuest II	Version 2.01

The evaluation was done during the development of a simple database application. Development time and difficulty for each function were considered in a subjective evaluation. Execution times for the various functions were compiled as a measure of performance.

Our test methodology is described in Section 2. Section 3 presents the products' evaluations, the results of the timed tests and the subjective evaluation. Finally, conclusions are presented in Section 4.

SECTION 2
TEST METHODOLOGY

OBJECTIVE:

Evaluate the performance, features, ease of use, learning curves, and program flexibility of end-user databases and report writers available for the BTOS environment.

TESTING ENVIRONMENT AND PROCEDURES:

The standard hardware configurations for the benchmark tests were: 1) a B38 master (cluster controller) with 4MB of RAM, a 140MB SCSI disk, a 68MB system hard disk; and 2) a B28 cluster workstation with 4MB of RAM, and no hard disk. Performance testing was conducted on both the master and cluster workstation. The configuration was determined by considering the hardware components necessary to fairly compare all products while emulating a typical end-user's hardware environment.

Two supervisors, one with DBMS experience and one with BTOS experience, coordinated the efforts of three evaluators conducting the evaluations. These evaluators were "novice" end-users who had no prior experience with any of the database products being evaluated and had little database expertise. Personnel profiles of the evaluation staff are included in Appendix C.

All evaluators received a half day orientation before the evaluation began. The orientation included a presentation on the test and its purpose, a description of their roles and responsibilities, an introduction to test procedures, and the test schedule.

The supervisors set up the directory structures and loaded the software onto the cluster controller to evaluate the complexity of software installation.

The initial involvement with each product was the reading of all introductory literature and running the tutorials. A supervisor was present at all times to help evaluators with problems which they could not solve in a reasonable amount of time. Throughout the testing, evaluators were permitted to use vendor hotline support (if available). As part of the subjective evaluation, evaluators rated the quality of the introductory documentation and the tutorials.

Evaluators developed and tested procedures for each product. Completed test procedures were demonstrated to the supervisor using a standard 50 record database. After evaluating the last product, the evaluators rated the products based on ease of use and effectiveness in accomplishing the set of tasks.

Execution times for each of the tasks were not measured until after the procedures for all products had been developed. The procedure being timed was the only activity on the cluster.

EVALUATION CRITERIA:

Database performance was evaluated by testing the speed of data import, data manipulation, query execution, and report generation. Data used in the development of the applications and for all the performance tests were supplied by the Coast Guard Information Systems Center.

Ease of use and ease of learn. ᶨ were evaluated by "novice" end-users. Participating vendors were also afforded the opportunity to develop the same application to ensure consistent evaluation of all products.

THE TEST APPLICATION:

In order to simulate a real life situation, the evaluators developed a Coast Guard unit's personnel roster application. Since the intent of this evaluation was to focus on the end-user, we evaluated a database with a single relation. The relation/table was named PERSONNEL.

The PERSONNEL table had the following fields:

Field Name	Description	Type	Decimals	Format
ssn	Unique Identifying Number {primary key}	integer		999999999
lname	Last Name	character		X(15)
fname	First Name	character		X(10)
mi	Middle Initial	character		X(1)
rank	Rank	character		X(5)
reported	Date Reported Unit (MM/DD/YY)	date		99/99/99
departure	Scheduled Departure from Unit (MM/DD/YY)	date		99/99/99
pay	Monthly Pay	decimal	2	9999.99
baq	Monthly BAQ (Quarter's Allowance)	decimal	2	999.99
vha	Monthly VHA (Variable Housing Allowance)	decimal	2	999.99
bas	Monthly BAS (Subsistence Allowance)	decimal	2	999.99
dob	Date of Birth (MM/DD/YY)	date		99/99/99
home	Home State Abbreviation	character		X(2)
marstatus	Marital Status (S, M, or D)	character		X(1)
sex	SEX (M or F)	character		X(1)

FORMATTING NOTES:
*** 9 --- a numeric value
*** X --- an alphanumeric value

MEASUREMENT METHOD

Performance was measured using a stop watch. Timings began from
the time the computer was in control executing the command or
program until the time the operator was able to use the computer
again. If an operation required input after the operation/
program began, the watch was stopped and restarted after the
required input was entered. To avoid insignificant levels of
precision, the minimum time for any test was one second. Ninety
minutes was the maximum allowable time for any single test.

DATABASE SIZES:

The evaluators used a small database (50 record) for their
development work and recorded the times for each test on both
master and cluster workstations. After they had successfully
completed the small database tests, they continued with the
performance testing on a medium database (500 records) and a
large database (5,000 records).

PROCEDURE SPECIFICS:

Times for commonly encountered transactions were used as the
basis for benchmark performance. Using the two test
configurations, the evaluator performed the following series of
tests described in the next section. Set-up time was not be
included in the actual benchmark timings. However, the evaluator
noted the procedures used to accomplish a specific test. This
ensured the tests could be repeated exactly.

Predetermined output for each test was provided to the evaluators
to compare with their results.

DBMS BAKE-OFF TESTS

TEST I --- DATA IMPORT

This test required the evaluator to import all 15 fields of the delimitted ASCII file into the PERSONNEL file. The evaluator recorded the time necessary to complete the import.

After successful data import, the evaluator made backup copies of the database/data files before proceeding. This was done because some tests required reloading the test data.

Some databases required an additional step to index the SSN field (primary key). The evaluator included the time for indexing this field along with the import time.

TEST II --- DATA MANIPULATION

A.   Sorting, non-indexed, ascending --- This test required the evaluator to perform a non-indexed, ascending sort on the PERSONNEL database using the LNAME field. The results of this sort were sent to a disk file.

B.   Reindexing --- This test required the evaluator to add an index using the LNAME field.

TEST III --- QUERIES

A.   Simple Search, 1 Record --- This test required the evaluator
to build a search/query to find and display a personnel record
which met the following criteria:

   Find the record where SSN is 548110914.

The record was displayed to the screen with the following fields:

      a.   SSN
      b.   LNAME
      c.   FNAME
      d.   MI
      e.   RANK
      f.   PAY
      g.   DOB

B.   Simple Search, multiple records --- This test required the
evaluator to build a search/query to find and display the 10
personnel records which met the following criteria:

   Find all records for dob's which fall in the following ranges:

      a.   12/01/49 thru 12/01/54   {50 record database}

      b.   12/01/53 thru 06/10/54   {500 record database}

      c.   12/02/53 thru 12/16/53   {5,000 record database}

These records were displayed to the screen with the following
fields:

      a.   SSN
      b.   LNAME
      c.   FNAME
      d.   MI
      e.   RANK
      f.   PAY
      g.   DOB

C. Complex Search, Multiple Records, Multiple Criteria --- This test required the evaluator to build a search/query to find and display the 10 personnel records which met the following criteria:

Find all records which fall in the following ranges:

50 record database

 a. 400000000 <= SSN <= 800000000

 b. 2000 <= PAY <= 4000

 c. 12/01/48 <= DOB <= 12/01/57

 d. SEX = M

 e. MARSTATUS = M

 f. HOME = {NM, KY}

500 record database

 a. 100000000 <= SSN <= 800000000

 b. 2000 <= PAY <= 6000

 c. 12/01/40 <= DOB <= 12/01/57

 d. SEX = M

 e. MARSTATUS = M

 f. HOME = {NH, VT, MA}

5,000 record database

 a. 360000000 <= SSN <= 800000000

 b. 3000 <= PAY <= 6000

 c. 12/01/42 <= DOB <= 12/01/57

 d. SEX = M

 e. MARSTATUS = M

 f. HOME = {NH, VT, MA, ME}

These records were displayed to the screen with the following
fields:

    a. SSN
    b. LNAME
    c. FNAME
    d. MI
    e. RANK
    f. PAY
    g. DOB
    h. SEX
    i. MARSTATUS
    j. HOME

TEST IV --- REPORTS

Search Records for Totals Computation --- This test required the
evaluator to develop a report/query which:

    (1) counted the total number of records in the database

    (2) summed the PAY, BAQ, VHA, and BAS fields for all
         records

    (3) calculated the average PAY, average BAQ, average VHA,
         and average BAS for all records.

    (4) printed a grand total for all money associated with
         personnel --- GRAND TOTAL = PAY + BAQ + VHA + BAS.

    (5) calculated the average compensation per individual ---
         AVERAGE COMPENSATION = GRAND TOTAL / TOTAL RECORDS.

The report was formatted and contained fields similar to the following:

```
                    PERSONNEL FILE
               COMPENSATION SUMMARY REPORT
               ============================

               RECORDS PROCESSED:    9,999

                    TOTAL              AVERAGE
                  COMPENSATION       COMPENSATION
               ----------------    ------------

PAY            $999,999,999.99     $999,999.99

BAQ            $999,999,999.99     $999,999.99

VHA            $999,999,999.99     $999,999.99

BAS            $999,999,999.99     $999,999.99

               ================    ============

TOTAL          $999,999,999.99     $999,999.99
```

TEST V --- COMPLEX DATA MANIPULATION

A.   Deleting --- This test required the evaluator to delete all records from the PERSONNEL database whose last name was LIMA.

B.   Global Changes --- This test required the evaluator to start this test with a new database file (i.e., restored the database from the backup copy made in Test I). The evaluator was instructed to change the value of all PAY fields to reflect a 6% increase (PAY = PAY *1.06).

C.   Modify File/Relation Structure

    1.   **Add a Field** --- This test required the evaluator to add
a new field to the PERSONNEL database. The new field was called
"DUTYSTATION". The DUTYSTATION field was character type with
format X(25). After the field was created, the evaluator loaded
this field with "USCG INFO SYSTEMS CENTER" for all records. The
time recorded for this test included both the creation of the
field (restructuring the database if necessary) and the loading
of the default input value.

    2.   **Delete a field** --- This test required the evaluator to
delete an existing field from the PERSONNEL database. The
evaluator deleted the DUTYSTATION field. The time recorded for
this test included the time necessary for re-structuring the
database (if necessary).

TEST VI --- BUILD INPUT SCREEN

This test required the evaluator to build/generate a form/program
that allowed the evaluator to enter records into the database.
The data entry screen prepared for this test contained the
following fields: SSN, LNAME, FNAME, MI, REPORTED, DEPARTURE,
PAY, HOME, MARSTATUS, and SEX. This test was subjectively
evaluated on the ease of building the data entry screen(s), the
presentation of the screen(s), and flexibility. This test was
not timed.

SECTION 3-A
NARRATIVE EVALUATION

This section contains a narrative evaluation of each product. The narrative includes: the full product name, developer, product description, and a discussion of each product's performance. A summary, with strong and weak points, completes the narrative evaluation.

PRODUCT NAME: Application Development System (ADS)
                & PRESTO/REPORTER

DEVELOPER: Convergent Solutions, Inc.
                100 Metro Park South
                Laurence Harbor, NJ 08878
                (201) 290-0090

PRODUCT DESCRIPTION:

ADS is a full featured DBMS. PRESTO/REPORTER is a separate, user
friendly, read only program to perform queries on ADS files and
generate reports.

Applications are built using a high level, forms oriented, fourth
generation language (4GL) called Processing Definition Language
(PDL). PDL gives the developer the ability to generate very
complex applications. Programs created using the PDL are called
Processing Definitions (PDs).

ADS is menu driven and requires no knowledge of programming
languages to generate basic applications. The menu structure is
easy to use as it always displays three levels of menu commands.
To generate complex applications, the user must enter PDL code
with the ADS Text Editor. Consequently, some programming
knowledge is helpful for development of complex applications.

The following types of programs can be developed with ADS
software:

        o   Relational database management
        o   Data dictionary
        o   File maintenance (record addition, removal and
                correction)
        o   Report
        o   Personalized menus
        o   Ad hoc inquiries
        o   Text Management (word processing files or others)

PRESTO/REPORTER is a menu driven, user friendly, report
generator. These reports may be simple, such as one column of
data, or complex reports combining data from many files,
organized and printed in sections. PRESTO/REPORTER allows a user
to combine data from any number of files and define that set of
data as a "view." Reports can be generated from a previously
defined view or directly from a database file. For some
applications, PRESTO/REPORTER may serve very well. However,
PRESTO/REPORTER did not provide an appreciable advantage to ADS
in this evaluation.

DOCUMENTATION/TUTORIAL:

ADS documentation consists of a tutorial manual, a reference
manual and a quick reference guide. The tutorial is written
clearly and was easy to follow. However, the examples given in
both manuals do not adequately explain how to use PDL to create
the applications necessary for this evaluation. The software
itself is very complicated, while the documentation is clear for
a novice.

Hotline support was essential for testing this product. The
Convergent Solutions representative explained in detail how to
write the PD to perform the ASCII file import. Knowledge gained
from that example helped the evaluator get through the other
tests. Hotline support was very helpful.

PRESTO/REPORTER documentation consists of a tutorial and
reference manual bound as one volume. The evaluator found that
the PRESTO/REPORTER manual did not explain the product very well.
Combining multiple criteria in searches using "AND" or "OR"
operators is especially vague.

FILE STRUCTURE/DATA ENTRY:

ADS maintains a data dictionary which keeps definitions of the
fields used by all database files. All fields must be entered in
the dictionary before they can be used in a file. Setting up the
file structure requires two steps: defining each field in the
data dictionary, and creating the data file. The first step was
a fill-in-the-blank approach, while the second required a simple
listing of the fields to be included, with special notation for
keyed fields.

To add, modify, or delete a field, the user simply edits the list
of fields in the file and/or edits the data dictionary. Adding
data to a newly created field requires writing a simple PD.

ADS does not offer automatic data entry programming. Creating
the form was fairly easy with a full screen editor, however, the
user had to create a PD to perform a loop to accept entries
before the form could be used to enter data. The data entry
screen can be very user friendly if the required thought and
effort go into the PD.

DATA MANIPULATION:

Importing the ASCII file for this evaluation proved to be difficult. ADS includes a file import utility that could not be used for this test. Instead, the evaluator relied heavily on hotline support personnel who helped write a complicated PD to do the import.

ADS includes a Purge Data Files utility that makes it easy to delete records. A rather complicated PD must be written to perform global data changes.

QUERY:

Performing ad hoc queries involves filling in blanks on a screen which was relatively complicated. Query definitions can be saved for simple, repeated queries. Before the query can be saved, however, the user must go through the steps of creating a library.

PRESTO/REPORTER is somewhat more user friendly for performing queries. However, because of a bug in the software, PRESTO/REPORTER did not successfully perform the multiple-criteria search. Convergent Solutions acknowledged the bug and provided a work-around.

REPORT:

ADS reporting is not simple. The summary report for this evaluation required the creation of two forms with the screen forms editor. It also required a PD to calculate values.

PRESTO/REPORTER makes reporting somewhat simpler, but it is still more complicated than some other products in this evaluation.

SUMMARY:

Strong Points:

    o   User friendly menu structure
    o   Versatility to customize applications with PDL

Weak Points:

    o   Very complicated
    o   Heavy reliance on programming language
    o   Software bug in PRESTO/REPORTER, multiple-criteria
          searches

ADS did not do well in this evaluation. It is too complicated to
recommend to a novice. PRESTO/REPORTER could be used by a novice
for simple reports. However, the general impression was that
PRESTO was not very helpful. Finally, ADS was among the slowest
products in most of the benchmark tests.

[EDITOR'S NOTE: A BTOS II 3.0 protection violation error (Error
Code 80) prevented ADS from being tested on the master. Attempts
to resolve the problem with help from the ADS hotline were
unsuccessful.]

PRODUCT NAME: Fasport-dbm

DEVELOPER: Software Research, Inc.
                1991 Crocker Road
                Suite 210
                Cleveland, OH   44145-1962

PRODUCT DESCRIPTION:

Fasport-dbm is modular in design. It consists of seven modules
that handle all database management.

- o   Data Dictionary Maintenance
- o   Data Dictionary Listing
- o   Dictionary Merge
- o   Report Definition
- o   Print Reports
- o   Data Entry
- o   Menu

Each of these modules can be invoked from the BTOS Executive.
The Menu Module gives an application designer the capability to
build a menu to drive the Fasport modules. Menus can be used to
create a seamless user interface and eliminate the need to use
the BTOS Executive command line. However, Fasport-dbm is not
delivered with such a menu.

Each module in Fasport-dbm is menu driven. Data Entry and Report
Modules can also incorporate commands to process data using a
compact 4GL called Fasport Command Language (FCL). FCL is a
specialized database management language that interprets code at
execution time. It consists of simple syntax and operators. No
prior programming knowledge is required for using FCL, although,
it would be helpful.

Fasport-dbm uses standard file access methods. It can directly
access standard ISAM, SAM and DAM files created by other sources.

DOCUMENTATION/TUTORIAL:

Fasport documentation includes a tutorial and a reference manual,
bound as one volume. The tutorial was clearly written and was
especially helpful for the file setup and data entry portions of
this evaluation. It was not very helpful for building the
summary report. The reference manual was often unclear and
incomplete. Neither manual included an index. Consequently, the
evaluator was unable to find much of the information needed to
successfully complete the tests.

Hotline support was prompt and helpful. The Software Research representative patiently guided the evaluator through the more difficult procedures, supplying information the manuals lacked.

FILE STRUCTURE/DATA ENTRY:

Fasport's Data Dictionary Maintenance Module defines the file structure. Setting up the file and redefining, adding, or deleting fields was done simply by answering prompts and editing the list of fields. Re-indexing the file required an additional step; performing an ISAM Reorganize from the BTOS Executive. The evaluator required hotline assistance to perform this step with the correct parameters.

Data entry was very simple. The Data Entry Module quickly generates a default form using the file structure. It also allows for creation of a custom data entry form.

DATA MANIPULATION:

Fasport-dbm handles data manipulation such as record deletion, global updates, and file conversion (from ASCII to ISAM) using the Report Definition Module. This module allows the user to add FCL statements to perform the required manipulation for each record in the report. Many updates required only one or two statements. The global update test revealed a bug in Fasport that would not allow some numeric fields to be written to some records. Software Research quickly fixed the problem and sent us an updated version of Fasport.

Because Fasport-dbm directly accesses standard file types, an ASCII file does not have to be imported to be used. A report program with several FCL statements and a separate data dictionary for the ASCII file were required to convert the data into an ISAM file.

QUERY:

Fasport does not allow true ad hoc queries. All queries are done using the Report Definition Module. Searches and sorts are set up with this module. The user must enter field values at run time in the Print Reports Module.

REPORT:

The summary report of this evaluation was very difficult to set up. An output format must be laid out with a line-by-line definition since there was no full screen editor. Calculations are done with FCL statements. Much help from the hotline was necessary to perform the summary report test.

SUMMARY:

Strong Points:

    o   Clear tutorial (on most subjects)
    o   Prompt and supportive hotline
    o   Auto-generated data entry forms
    o   Can be used directly on ASCII files

Weak Points:

    o   No index in documentation
    o   Missing or hard to find information in documentation
    o   Complicated report setup (especially summary reports)
    o   Complicated file conversion

A novice would have a difficult time using the package. However,
Fasport-dbm was faster than average in the benchmark tests.

PRODUCT NAME: Forms Plus Laser

DEVELOPER: Foresite
                775 Upland Road
                Redwood City, CA 94062
                (415) 363-0688

PRODUCT DESCRIPTION:

Forms Plus is the only product included in this evaluation that
was not designed primarily as a database management system. Its
primary function is to provide automated management of
pre-printed forms. Because this often involves using data from a
database, Forms Plus has been designed with some DBMS
capabilities. Its performance as a DBMS in this evaluation
should not be construed to imply any evaluation of its usefulness
as a forms processor.

Forms Plus performs the following five basic functions:

        o   Creating forms
        o   Changing forms
        o   Filling in forms
        o   Saving forms
        o   Printing forms

Forms Plus allows information on the forms to be retrieved from
or saved to either word processing or database files. In
addition to its own database files, Forms Plus can access ISAM
data sets created from other sources, including ADS, PDS-ADEPT,
R:BASE, and reQuest.

DOCUMENTATION/TUTORIAL:

The Forms Plus documentation included a reference guide and a
quick-reference card. Initially, the documentation was somewhat
confusing (perhaps because it is not primarily a DBMS). The
reference guide contains no index, making problem solving
difficult.

The tutorial section of the guide often relied on explanation by
example. It presented an example, but did not explain how to
design a similar application. Users are left to explore the
sample application to see how it was put together. The example
of a database created by Forms Plus was especially confusing.

The evaluator required hotline support to create a summary report
in the format required for this evaluation. The Foresite
representatives were courteous and helpful.

FILE STRUCTURE/DATA ENTRY:

Setting up the file structure and the data entry screen were
fairly simple with Forms Plus. The database file was created by
building a data entry form and defining "keynames" for every
blank in the form. Users can then create a data set using the
keynames as the names of the fields.

To add, delete, or modify a field in the data set, users must
make the appropriate change to the data entry form and re-create
the data set. Then, data must be reloaded into the new file.

DATA MANIPULATION:

Data manipulation capabilities are built around retrieving and
saving information to and from a form. To import an ASCII file,
the evaluator had to edit the file to separate records by "!" and
add a first record with the names of the fields. Then the data
entry form could be used to retrieve records from the ASCII file
(defined as a word processing file) and to save records to the
database file.

Making global changes to the database required creating a
temporary file to hold the updated values. The original file was
deleted. This process was relatively complicated.

Forms Plus is not capable of deleting records automatically.
Users can have the form retrieve the records to be deleted, but
deleting them requires several keystrokes for each record.

QUERY:

Ad hoc queries were handled fairly simply with Forms Plus,
although the user is required to create a form laying out the
query output format. Forms Plus retrieved records to the created
form according to previously defined selection criteria.

Forms Plus was unable to complete the multiple criteria search of
this evaluation because of a limitation to four fields for
selection criteria.

Forms Plus could sort records in a query, but only on a field
defined as a key field. When Forms Plus writes query results to
a file, it loses its columnar format.

REPORT:

Forms Plus was able to produce the required results for the summary report test, although it was not simple. The report form processed only ten records at a time. A new form for every ten records was produced with running totals. Only the last form gave the correct results. The evaluator required assistance from Foresite for this report.

SUMMARY:

Strong Points:

    o   Simple forms design

Weak Points:

    o   Very limited DBMS features
    o   No index in documentation
    o   No automatic deletion
    o   No sort on non-key fields
    o   Several steps required for simple DBMS tasks
    o   Limitation on multiple criteria searches
    o   Automatic update requires creating new file
    o   Complicated reporting

In this evaluation, Forms Plus did not do well as a database management system. The evaluators do not recommend it for a novice. It was slower than average in most of the benchmark tests.

PRODUCT NAME: INFORMIX-SQL

DEVELOPER: Informix Software, Inc.
                4100 Bohannon Drive
                Menlo Park, CA   94025
                (415) 322-4100

PRODUCT DESCRIPTION:

INFORMIX-SQL is menu driven, but it performs queries and data
manipulation using an enhanced version of SQL called RDSQL.
Reports and complex applications require some programming
ability.

INFORMIX-SQL allows the user to perform the following functions:

     o   Create and modify tables using the menus provided with
           the schema editor
     o   Enter and retrieve database information using screen
           forms
     o   Sort, combine, format, and display data with reports
     o   Enter, modify, and retrieve database information using
           the query language
     o   Access INFORMIX-SQL through special purpose, custom
           menus

INFORMIX-SQL uses a POSIX server as an extension of BTOS to allow
INFORMIX-SQL to operate in its native UNIX mode. The POSIX
server allows INFORMIX-SQL to think it is running under UNIX,
while BTOS thinks it is handling another BTOS server. All of the
system level calls from INFORMIX are handled by the POSIX server.

DOCUMENTATION/TUTORIAL:

INFORMIX documentation includes a user guide and a reference
manual. Both documents are clearly written and contain very
helpful, cross-referenced indexes. The user guide was especially
helpful in learning to use the product.

The evaluator was unable to find instructions for importing the
ASCII file and had to call the INFORMIX hotline for help. The
INFORMIX representative was very helpful and explained the
process step by step.

FILE STRUCTURE/DATA ENTRY:

The file structure was easy to set up through menu selections and prompts for each field. Adding, deleting, or modifying fields was also simple because of the menu structure.

INFORMIX allows users to create a custom data entry form using a forms editor. A default form can also be generated quickly and simply.

DATA MANIPULATION:

Record deletion and global updates are handled simply with a single RDSQL statement. The package includes a utility for importing files that is invoked from the BTOS Executive. Users can create a command file with a fairly simple program using the BTOS editor. However, the evaluator was unable to find this procedure in the documentation and required assistance from the INFORMIX hotline.

QUERY:

Ad hoc queries were very simple with INFORMIX. They are defined by a single RDSQL statement and invoked from the menu.

REPORT:

INFORMIX generates a default report program that writes a simple database report. Users can modify the default program or create a report program from scratch with the BTOS editor. The summary report was rather difficult to produce, requiring some trial and error along with hotline assistance. The summary report format could not be laid out with a full screen editor. Program statements were required to count spaces and lines.

The report test also revealed a bug that caused the system to hang several times. The INFORMIX hotline gave a work-around that eliminated the problem.

SUMMARY:

Strong Points:

    o   Clear documentation with a useful index
    o   Simple data manipulation and queries with RDSQL
    o   Good hotline support
    o   Simple menu structure

Weak Points:

    o   Programming required for reports
    o   Complicated report formatting
    o   Spurious error messages
    o   Software bug that caused system to hang up

The evaluators were generally pleased with INFORMIX. It is recommended as a product that novices could use. INFORMIX was among the fastest products in most of the benchmark tests.

PRODUCT NAME: Intelligent Query (IQ)

DEVELOPER: Programmed Intelligence Corporation
                 6991 Peachtree Industrial Blvd.
                 Suite 100
                 Norcross, GA   30092
                 (404) 446-8880

PRODUCT DESCRIPTION:

IQ was the only independent product included in this evaluation
that is a read only query program. IQ may be set up to produce
ad hoc queries or reports from database files from a variety of
sources. ADS database files were used in this evaluation. IQ
can present database information in the following ways:

    o   Quick, automatically formatted reports
    o   Ad hoc queries
    o   Custom designed reports
    o   Bar graphs (X-Y and histograms)
    o   Formatted data for other systems

IQ is completely menu driven. It also offers the option of
directly editing the command language code or even writing the
code from scratch. For most applications the code generated
using the menu driven format will not need to be edited.

DOCUMENTATION/TUTORIAL:

IQ documentation includes a user's manual and technical reference
manual bound as one volume. The user's manual contains two
tutorial sections which are written for the user who would not be
setting up the file structure. Instructions for setting up the
file structure were not clear, and were found only in the
technical reference manual. Generally, instructions for the
end-user were clearly written.

The IQ documentation used in this evaluation was written for a
DOS based system. Lack of BTOS documentation resulted in some
minor discrepancies regarding keystrokes and some confusion about
file structure setup. Programmed Intelligence indicated that a
new version of IQ is available that includes a CTOS/BTOS section
in its documentation, but was unavailable for this evaluation.

FILE STRUCTURE/DATA ENTRY:

Because IQ was a read only program, the data dictionary was set
up to point to an existing file. This procedure was very
difficult, almost impossible using the DOS oriented
documentation. The example database in the tutorial was used as
a model for the data dictionary file parameters.

Since IQ is a read only product, it cannot be used to enter data.

DATA MANIPULATION:

Since IQ is a read only product, it cannot be used to manipulate
data in the database file.

QUERY:

Developing ad hoc queries in IQ is easy and quick. The menu
structure makes designing queries simple and allows users to name
and save a query for future use.

REPORT:

Designing a formatted report is also easy with IQ. The format is
set up using a full screen editor. Defining calculated fields is
done by choosing menu items and answering prompts. IQ was easily
able to produce the required summary report.

SUMMARY:

<u>Strong Points:</u>

    o   Very simple to perform queries and reports
    o   Allows editing the source code directly

<u>Weak Points:</u>

    o   Read only program
    o   Complicated file structure setup
    o   Exiting from some screens allows work to be lost
         without warning

IQ is a very simple program for a user. The evaluators recommend
it to the novice if someone with more experience sets up the file
structure to point to the files to be queried. It is not a full
featured DBMS product.

PRODUCT NAME: Oracle

DEVELOPER: Oracle Corporation
                 20 Davis Drive
                 Belmont, CA 94002
                 (415) 598-8000

OEM/VAR: Unisys Corporation
                 Federal Information Systems
                 8008 Westpark Drive
                 McLean, VA 22102
                 (703) 556-5589

PRODUCT DESCRIPTION:

Both Unisys and Oracle Corporations have versions of Oracle which
are available for BTOS systems. The products are essentially the
same except where indicated below.

Oracle is a versatile relational database management system that
is targeted for programmers and developers. The heart of the
Oracle system is Oracle RDBMS, which performs the actual database
management tasks. The system includes several other products,
some of which are necessary for basic DBMS tasks. In addition to
Oracle RDBMS, the following products were used to complete the
tasks in this evaluation:

        o   SQL*Plus - An interactive command driven interface to
                          Oracle. SQL*Plus uses SQL commands to
                          perform file definition, ad hoc queries,
                          and basic data manipulation.

        o   SQL*Forms - A forms generation facility which permits
                          the construction of fill-in-the-blank
                          forms for structured query, data entry and
                          update.

        o   SQL*Report - A complete multi-table reports generator.

        o   SQL*Loader - A product for moving data in external
                          files into tables in an Oracle database.

Several other products are also available in the Oracle system to
handle a variety of DBMS tasks. These include spreadsheet,
graphing, networking, menu management, and programming interface
products.

The primary interface to Oracle is the Standard Query Language
(SQL). Data definition, data manipulation and data access are
done through DDL, DML and DCL, which are all subsets of SQL.

Both Oracle Corporation and Unisys versions of Oracle were tested in this evaluation. Procedural differences between the two products are minor.

DOCUMENTATION/TUTORIAL:

Sixteen separate Oracle manuals were available for this evaluation. Among those available are: four SQL*Plus documents, seven SQL*Forms documents, one SQL*Report user's guide, and one SQL*Loader user's guide. The manuals were generic and not specific to any particular operating system. Other volumes were general Oracle documentation and user's guides for products not used in this evaluation. All documentation was provided by Oracle Corporation.

The number of manuals was somewhat confusing at first. A novice would not know which document to start with. The SQL*Plus user's guide and other SQL*Plus documentation were written clearly and very helpful for basic database management functions. The SQL*Report user's guide and the SQL*Loader user's guide were also written clearly, but the procedures were very difficult for a novice. The SQL*Forms procedure used in this evaluation was too simple to require in-depth study of its documentation.

Both Unisys and Oracle Corporation hotline support were slow. Unisys was called for help for importing the ASCII file and was not very helpful. Unisys did help to solve a problem getting SQL*Forms to run, however. Oracle support gave the proper procedure for deleting a field from the file.

FILE STRUCTURE/DATA ENTRY:

The file structure was easy to set up with SQL*Plus. A table can be created with one SQL statement. Defining a key field is not necessary with Oracle, but can be done simply with a single statement. Adding a field is also a simple, one statement procedure. But, Oracle did not include a command to delete a field from a table. To delete a field, users must create a new table with a statement that includes all fields except the one to be deleted, remove the old, and rename the new table.

The SQL*Forms utility is a menu driven program that includes the ability to generate a default form for data entry. The procedure is very simple. After some trouble starting up SQL*Forms, Unisys solved this problem with instructions for properly installing the product. The SQL*Forms keyboard assignments is one difference between Unisys and Oracle versions of the product. Keyboard assignments for both versions were a bit confusing. Neither program prompts the user through the keystrokes.

DATA MANIPULATION:

Basic data manipulation such as adding, modifying, or deleting
records in a table was quite easy with SQL*Plus. Each procedure
required only one SQL statement. Importing an ASCII file was
very difficult. SQL*Loader required the user to create a command
file using the BTOS Editor, and then invoke the SQL*Loader
utility from the BTOS Executive.

QUERY:

SQL*Plus performs ad hoc queries quickly and simply with SQL
statements.

REPORT:

SQL*Report requires the user to write a complicated program and
go through a two step execution process. Since there is no
ability to format fields or text on a full screen editor, the
user has to calculate column widths and code them directly into
the program. A novice must spend a great deal of time with the
SQL*Report user's guide to understand and use the program.

SUMMARY:

Strong Points:

    o   Simple file structure set up
    o   Quick and easy ad hoc queries and file updates
    o   Default form generation

Weak Points:

    o   Very complicated report formatting
    o   Very complicated data import
    o   Confusing SQL*Forms key assignments
    o   Too many manuals for novice
    o   Requires 4MB of RAM

SQL*Plus made a good impression with its simplicity and power.
Overall, however, Oracle was too complicated for a novice.
Oracle was among the products with the fastest times in the
benchmark tests.

PRODUCT NAME: Paradise

DEVELOPER: Software Inc. - 2H+ Product Line
                500 Sutter Street, Suite 222
                San Franscisco, CA 94102
                (415) 397-4666

PRODUCT DESCRIPTION:

Paradise is a menu driven relational database management system
with a multi-window environment developed by 2H+, a French
software company. The following types of programs can be
develcped with the software:

    o   Maintenance (record addition, removal, and correction)
    o   Inquiry
    o   Report
    o   Personalized menus
    o   Word Processor
    o   Clock, Calendar, and Calculator

The Paradise word processing module handles all file, field,
calculation, and report definitions. By simply defining how the
data has to look on the screen, Paradise creates the underlying
database structures. Paradise application development is
straight forward and consistent. The word processing module is
used everywhere.

Paradise also includes "Desktop Productivity" tools. From the
Paradise main menu the user can access the Word Processor, a
Calendar, a Clock and a Calculator. Applications generated by
Paradise can be user friendly and completely menu driven.

Paradise also makes extensive use of colors and windows.

DOCUMENTATION/TUTORIAL:

Paradise documentation includes a tutorial, a reference manual
and a quick reference guide. The reference manual was useful.
However, commands could be explained more, with better examples
on their use. The Paradise tutorial was very helpful with
several examples that could be followed easily.

Hotline support from Paradise was excellent. Paradise was called
for help in writing query results to a file, deleting or updating
records. Their support people were professional, prompt and
helpful. They quickly solved a bug involving dates and sent a
new version of the software.

FILE STRUCTURE/DATA ENTRY:

Setting up the file structure with Paradise is very easy using its menu driven, window oriented format. Adding, deleting, or modifying fields is also easy by selecting "file creation" or "modify" from the menu and filling in the appropriate change.

The data entry screen was automatically set up when the file structure was entered. Fields were displayed in the data entry screen just as they were entered in file creation. Use of the screen to enter data was very simple.

DATA MANIPULATION:

Data manipulation is done using reports. The procedure in the documentation for writing a report to import an ASCII file is good. The evaluator required minor assistance to delete and update records, but found it was fairly simple after hotline assistance.

QUERY:

Paradise also performs ad hoc queries with reports. Queries to the screen were simple. Writing the results to a file was a great deal of trouble requiring hotline assistance. Query results can be written to a file by creating a second file with a structure identical to the original, then assigning the values from the report to it.

A software bug delayed tests involving searches on date fields. Paradise acknowledged the bug and quickly sent new software which performed the queries correctly.

REPORT:

The summary report was relatively easy with Paradise. The report generator easily handled the totals and averages needed for the report.

SUMMARY:

Strong Points:

    o   Good reference manual and excellent tutorial
    o   Good hotline support
    o   Easy to use

Weak Points:

    o   Bug involving searches on date field (fixed)
    o   Slow menus

Paradise is easy to use. The evaluators generally liked the
product and would recommend Paradise to a novice. Paradise
execution times were slower than average in many of the benchmark
tests.

PRODUCT NAME: PDS-Adept & PDS-Query

DEVELOPER: Parameter Driven Software, Inc.
                30800 Telegraph Road
                Suite 3820
                Birmingham, Michigan 48010
                (313) 540-4460

PRODUCT DESCRIPTION:

PDS-Adept is a full featured DBMS. PDS-Query is a separate, user
friendly, read only program that performs queries on PDS-Adept
files.

PDS-Adept includes two completely separate modules: PDS-Adept
Define Mode and PDS-Adept Run Mode (usually known simply as
"Define side" and "Run side"). The Define side allows users to
define file structures and develop procedures such as reports or
updates. The Run side allows the user to run procedures already
created. Users with access to both sides may swap quickly from
side to side with a single keystroke.

Application programs built by PDS-Adept are called "identifiers."
The following six types of identifiers can be developed:

        o   Data Input
        o   Menu
        o   Batch Update
        o   Inquiry
        o   Report
        o   File Definition

PDS-Adept uses a parameter driven approach to application
development. Programs are created by "filling-in-the-blank," in
response to screen prompts.

PDS-Adept supports ISAM, SAM, and DAM files. It provides
concurrent access to one main file and seven secondary files,
including up to five indexes for each file.

PDS-Query performs simple queries and reports on PDS-Adept files
easily using a menu driven structure. It is very limited,
however. PDS-Query was unable to complete several of the queries
and the report in this evaluation.

DOCUMENTATION/TUTORIAL:

PDS-Adept documentation includes a Define Mode manual, a much
shorter Run Mode manual, and a Demo Guide/Tutorial. The tutorial
and the manuals are very helpful in understanding the basics of
the six identifier types, but it stopped short of explaining the
operational statements required to develop many applications.
The manuals explained the statements, but did not include enough
relevant examples to really understand how to use them.

PDS-Query comes with a user's guide that explains the product
very well. It includes a short "Quick Glance" section which
provides adequate instruction for an Adept user to use Query.
PDS-Query documentation also includes a tutorial and a reference
section.

The evaluator used the PDS hotline support to get assistance in
importing the ASCII file, using proper date format, adding a
field, and producing the summary report. The PDS representative
pointed out the general direction to proceed, but did not step
through the processes nor volunteer more information than
specifically requested.

In spite of its menu driven structure, PDS-Adept is very
difficult for a novice to use, primarily because of limited
documentation.

FILE STRUCTURE/DATA ENTRY:

PDS-Adept defines a file structure with a File Definition
identifier (FD). This identifier can be created directly or
generated from a Data Input identifier.   Using either method,
users simply fill in blanks, listing each field and its
attributes and answering prompts about the file being created.

It was easy to add a field to the database using the Data Entry
identifier. Difficulties were encountered while loading a field
with the value "USCG INFO SYSTEMS CENTER" because the Batch
Update identifier would not allow a value that long. The problem
was solved by creating two new fields and adding half the value
in each field. Deleting the new fields was very simple.

PDS-Adept directly accesses ASCII files as SAM files and does not
require files to be imported. To convert the file to ISAM,
however, the evaluator created a Batch Update identifier that
moved data from the SAM file to an ISAM file. This involved
using operational statements that moved each field. Each date
field required six statements to concatenate the six digits into
the proper order. The evaluator needed assistance from PDS to
convert the file into ISAM format.

DATA MANIPULATION:

PDS-Adept used Global Update identifiers to add or delete records or perform any global changes. These tests were simple, requiring one operation statement in each identifier.

Adding a secondary key to a PDS-Adept ISAM file required five steps: 1) rename the ISAM file to a scratch file; 2) delete the index using the BTOS Executive; 3) enter PDS-Adept Define to change the FD to add the new key field; 4) return to BTOS Executive to overwrite the new file with the old data; 5) perform an ISAM REORGANIZE.

QUERY:

PDS-Query allows the user to perform ad hoc queries with simple Inquiry identifiers. Queries for this evaluation, however, were performed by PDS-Adept with the Report identifier.

Sorting a file with PDS-Adept on a non-indexed field is not difficult, but requires creating a Report identifier (which includes six screens of fill-in-the-blanks). PDS-Query provided a simpler method for performing a sort.

REPORT:

Each PDS-Adept Report identifier includes six screens. The user simply answers the prompts, filling in each screen. PDS-Adept reports are not created with a full screen editor. Instead, users must list the position of each field to be displayed by column number. The summary report for this evaluation required using operation statements that were not explained in detail in the documentation.

PDS-Query provided a very easy way of doing simple queries and reports. Its usefulness was limited for this evaluation, however. PDS-Query was not able to perform the multiple record/multiple criteria search because of its limited to a maximum of five search criteria. PDS-Query was also unable to perform the summary report because it does not calculate averages.

SUMMARY:

Strong Points:

    o   Versatility provided by operation statements
    o   Fill-in-the-blank method is easy for simple
           applications
    o   PDS-Query very easy

Weak Points:

    o   Several screens to fill in for each application
    o   Operation statements complicated and not explained well
    o   Poor documentation
    o   Weak hotline support
    o   PDS-Query very limited

The menu driven structure of PDS-Adept did not make this product
easy to use. PDS-Adept is a very versatile product, but the
operation statements needed for most identifiers and the number
of screens to fill in make it more complicated than most other
products evaluated. PDS-Adept is not recommended for a novice.
It had about average performance in most of the benchmark tests.

PRODUCT NAME: PROGRESS & PROGRESS FAST TRACK

DEVELOPER: Progress Software Corporation
                5 Oak Park
                Bedford, MA   01730
                (617) 275-4500

PRODUCT DESCRIPTION:

PROGRESS is a complete relational database management system and
application generator. PROGRESS FAST TRACK is a front-end
product that may be used for queries, reports and very simple
data manipulation of PROGRESS files. FAST TRACK is a separate
product and can be ordered either as part of the package or as a
separate product.

PROGRESS uses a 4GL called Progress Application Language (PAL).
This is a powerful language with structures similar to Pascal and
Basic. Most DBMS tasks are performed in PROGRESS by entering a
simple PAL program in an "edit window." PROGRESS also includes
some menu driven modules that are invoked by entering a single
command in the edit window.

FAST TRACK is a menu driven program that includes the following
features:

        o   Menu Editor   simplifies building menus and
                                  automatically generates a menu tree
                                  that shows the structure of an
                                  application

        o   Screen Painter   utility to generate forms for entering
                                  or displaying data

        o   QBF Generator   ad hoc query generator

PROGRESS and PROGRESS FAST TRACK do not use BTOS ISAM files, but
implement their own data management structure.

DOCUMENTATION/TUTORIAL:

PROGRESS is delivered with ten separate manuals and guides,
including eight PROGRESS volumes and two PROGRESS FAST TRACK
books. The documentation is somewhat confusing, because there is
no indication as to where to begin. The PROGRESS tutorial and
reference manual are clear and very helpful. The PROGRESS FAST
TRACK tutorial and user's guide are written clearly, but seem to
be missing information that would have been helpful for this
evaluation. Although the manuals were easy to understand and
filled with good examples, some sort of cross referenced index
for all PROGRESS documentation would be helpful. Without such an
index, some specific information is difficult to find.

Hotline support is quick and helpful. Calls were made to
Progress for help with the file import procedure and for
formatting a report. The hotline also helped with problems
encountered while getting started with FAST TRACK.

FAST TRACK converts all of its procedures to Progress PAL before
executing. The PAL can then be modified using the Progress
Editor for use in a "prototyping" environment.

FILE STRUCTURE/DATA ENTRY:

The PROGRESS file structure was set up using a menu driven
utility called with the command "DICT" from the edit window or
from the on-line "help" menu. Setting up the structure was a
simple matter of answering prompts. Adding, deleting, or
modifying fields is also a simple matter with this menu utility.
Modifying database structure does not require unloading of the
data and can be done on the fly.

Creating and using a data entry screen required writing a small
PAL program in the PROGRESS edit window. FAST TRACK offered a
simpler way of generating a default form for data entry with its
Screen Painter.

DATA MANIPULATION:

PROGRESS includes a data import facility as a part of the data
dictionary menu. This facility is straight forward to use. To
import ASCII data, a Quoter utility (provided with Progress) was
used to prepare the data for loading and then the import facility
was invoked.

All other data manipulation tasks for this evaluation (global
change, deleting records, and adding data) were performed by
writing a simple PAL program.

FAST TRACK can add or delete data, one record at a time, but
cannot perform global data manipulation tasks. Progress PAL
procedures must be written to do global data manipulation.

QUERY:

PROGRESS handles ad hoc queries with simple PAL programs. FAST
TRACK can generate a query with its Query By Form (QBF)
generator. This utility prompts for information and
automatically generates a form for the query. FAST TRACK's
Report Writer was used to perform the multiple criteria search.
The FAST TRACK documentation did not adequately explain how to do
queries with multiple search criteria.

REPORT:

Writing a formatted report, such as the summary report for this
evaluation, required the user to write a PAL program. PROGRESS
does not include a full screen editor for the report format.
Users must specify column numbers and line-by-line instructions
in the program or accept default field lengths and column
spacing. The hotline provided assistance on this test.

FAST TRACK allows a full screen editor to format a report, but
the evaluator did not find the process much easier. Hotline
assistance was necessary for this test, too.

SUMMARY:

Strong Points:

- o   PROGRESS's clear, logical design
- o   Good reference manual and tutorial
- o   Quick, helpful hotline support
- o   FAST TRACK creates default forms for easy ad hoc queries
- o   FAST TRACK converts everything to PROGRESS PAL before running

Weak Points:

- o   Difficult display format setup with PROGRESS
- o   Tedious number of steps with FAST TRACK
- o   No cross referenced index in documentation

The simple design and versatility offered by PROGRESS were impressive. However, the evaluators did not like using PROGRESS FAST TRACK. PROGRESS is recommended for the novice with some basic understanding of computer programming. PROGRESS execution times were among the fastest in the benchmark tests.

PRODUCT NAME: R:BASE 5000

DEVELOPER: Microrim
                  3925 159th Avenue NE
                  P.O. Box 97022
                  Redmond, WA 98073-9722

PRODUCT DESCRIPTION:

R:BASE uses an SQL-type language for inquiry, building, deleting,
and modifying tables; and for entering, deleting, and modifying
data. R:BASE also operates in "prompt mode," which prompts for
parameters to each command entered. Prompt mode eliminates the
need to remember the exact syntax of a command.

Reporting in R:BASE is handled by a menu driven report generator
integrated into the program. A forms generator with a full
screen editor is also included with R:BASE.

Application Express is a separate program included with R:BASE.
It allows users to build menu driven applications, including
forms and reports. For this evaluation, building such
applications was not necessary, but Application Express did
provide a easy way to create tables and define fields.

R:BASE does not use standard ISAM files, but uses its own access
method. ISAM type files are used solely as logical support for
its management. R:BASE does not require any indexed columns
(fields), but indexing one or more columns may speed processing
and aid in establishing relations among multiple tables.

DOCUMENTATION/TUTORIAL:

R:BASE documentation is excellent. It includes a user's manual
and a reference manual along with a "Command Summary" brochure
for quick reference. Both manuals are clearly written and easy
to understand. The index was complete and helpful. The only
documentation weakness found during the tests was vagueness about
computing averages in a report. The manual mentioned it but did
not explain it well.

The user's manual has an introductory tutorial and an advanced
tutorial. The introductory tutorial was very useful, the proper
length, and contained an appropriate level of detail. The
advanced tutorial covered applications not tested in this
evaluation.

The hotline support for R:BASE was a bit slow, but helpful. The
summary report test revealed a bug that caused a page to be
printed for every record in a summary report. R:BASE
acknowledged the bug and helped to work around the problem.

FILE STRUCTURE/DATA ENTRY:

Databases and tables were very easy to create with Application
Express. This menu driven program presents a screen with
fill-in-the-blank columns and prompts for names of the columns
(fields). R:BASE could do the same thing with an SQL command,
but the novice will find Application Express much simpler.

Adding and deleting fields and creating indexed fields are each
handled simply with a single command in R:BASE.

Creating the data entry form is also very simple with the forms
generator, invoked by the FORMS command. The generator is menu
driven with full screen editing. Using the form for data entry
is done by invoking the ENTER command.

DATA MANIPULATION:

R:BASE handles data manipulation easily. Adding or deleting a
record or performing a global update requires only one command.
Even importing an ASCII file requires only one command with no
need for special description files or programs.

QUERY:

Ad hoc queries are very simple with R:BASE. Each query requires
one SELECT command. The SELECT command must specify the table
and columns to be printed and may include clauses that specify
sort order and selection criteria.

Query output defaults to the screen, but the user can assign
output to a printer or file before performing the query. Query
output longer than 80 characters is truncated (both on screen and
in other outputs) unless the SET WIDTH command is used to
increase the output width. Once the width has been changed the
output wraps to the next line on the screen.

REPORT:

The report generator is a menu driven utility, invoked by a
R:BASE command, that allows users to lay out reports with a full
screen editor, define variables, and locate fields and variables
on the report. Each line in the layout is marked to define where
it should print (e.g., page header, detail line, break footer,
report footer). The report utility is simple and allows great
flexibility in designing reports. Although the process was not
difficult, the documentation was a bit unclear about computing
averages.

The evaluator found a bug trying to print a report without detail
lines. When laid out as instructed, the report resulted in a
blank page for every record. R:BASE confirmed the bug and gave a
work-around that used a break footer rather than a report footer.

SUMMARY:

Strong Points:

      o   Excellent documentation
      o   Simple ad hoc queries
      o   Menu driven report generation
      o   Easy structure setup with Application Express

Weak Points:

      o   Bug in generating summary reports
      o   Some command memorization required

R:BASE is not menu driven and requires the user to become
familiar with a command language. The documentation presents
these simple commands so clearly, however, that a novice should
have no trouble with this product. One evaluator was able to
perform all of the tests without hotline assistance. The speed
of R:BASE execution was about average in the benchmark tests.

PRODUCT NAME: reQuest

DEVELOPER: System Automation Software
                8555 Sixteenth Street
                Silver Spring, MD 20910
                (301) 565 9400

PRODUCT DESCRIPTION:

ReQuest is a module oriented program. It consists of five
separate "modules" that handle all database management:

     o   Search/Report
     o   Data Entry/Update
     o   Data Dictionary
     o   Menu Maintenance
     o   Security

ReQuest is completely menu driven, eliminating the need to
memorize commands or learn any languages. The first screen is
the main menu, which presents the five modules along with some
other options. Every other screen in reQuest contains a "display
frame" and a "command frame". The "display frame" is the work
area for building applications such as reports or data entry
forms. The "command frame" is the menu of commands for that
application.

ReQuest has an unusual way of selecting menu items. RETURN and
TAB move the cursor down and across the menu. GO executes the
highlighted command. The shortcut documented in the manual,
pressing CODE and the first letter of the command, does not work
on every screen.

ReQuest uses ISAM files which are incompatible with ISAM files
managed by most other database management systems.

Database files in reQuest are organized by "applications." Each
application may contain up to 100 files and one data dictionary.
The data dictionary contains definitions of all fields within the
application.

DOCUMENTATION/TUTORIAL:

ReQuest documentation includes a training manual and a reference manual. The training manual contains helpful information that is easy to understand. However, its format was weak. The tutorial exercises and the keystrokes were not set apart in any way, making it difficult to skim its 3C0+ pages.

The training manual and reference manual were clear on most subjects. The indexes were helpful, but neither manual was particularly helpful in setting up the summary report.

The reQuest hotline support representative was very helpful in setting up the summary report.

FILE STRUCTURE/DATA ENTRY:

ReQuest uses the Data Dictionary module to build or modify an application. ReQuest prompts for the name of the application and allows users to create or edit a table (file) or a data dictionary. For this evaluation, the evaluator created a table and let reQuest automatically generate the data dictionary. The program prompts for field names and all pertinent characteristics, which makes it simple to set up or change the file structure.

The Data Entry/Update module allows creation of a data entry form which can be used to enter or update individual records. The form is simple to design with the full screen editor.

DATA MANIPULATION:

The Data Entry/Update module is also used to manipulate data. This module requires building a form for each application. Data entry and individual record updates are simple procedures, but mass updates are not quite as simple. Deleting several records requires a user to create a search format in the Search/Report module, then invoke the Data Entry/Update module to execute a mass update on the selected records.

ReQuest has a Text File Conversion Utility, selected from the main menu, which handled the ASCII file import fairly simply. It requires a "description file" created with the BTOS Editor to match the format of the ASCII file. When the utility is invoked, it prompts for the names of the application and table to be loaded before performing the conversion. An appendix in the reference manual made this procedure simple.

QUERY:

ReQuest offers two ways to perform simple queries. The quickest way is to choose the Ad Hoc Report option from the main menu and write a SQL statement. This option is not well documented for novices, but provides a simple method that does not require the creation of any forms. Queries can also be done using the Search/Report module as described below.

REPORTS:

The Search/Report module performs simple queries or customized reports in the same way. It requires two forms or "formats". The report format determines how the output will appear on the screen or page, which fields and what text will be displayed and where they appear. The search format determines which records will be included in the report. Both formats are easy to create or edit. To perform a query or report, specify both a report format and a search format, unless all records will be used.

The summary report test presented some difficulty. The documentation did not clearly explain calculations or printing summary lines in the report. ReQuest hotline support was helpful in completing the report. This task revealed a bug in the software. Calculations using totals as base fields fail if the totals exceed the edit range of the field being totalled. This problem is solved by increasing the range of the numeric fields in the database table.

SUMMARY:

Strong Points:

    o   No commands or programming knowledge necessary
    o   Ability to do ad hoc queries
    o   Easy form and report design

Weak Points:

    o   Tedious menu structure
    o   Tutorial difficult to follow
    o   Unclear procedure for summary report
    o   Bug in software for summary report

ReQuest was capable of handling everything in this evaluation without much difficulty. The menu driven nature of reQuest makes learning languages or commands unnecessary. The evaluators do not recommend reQuest for novices without some training or assistance. ReQuest was among the slowest products in most of the benchmark tests.

PRODUCT NAME: reQuest II

DEVELOPER: System Automation Software Inc. (SASI)
                8555 Sixteenth Street
                Silver Spring, MD 20910
                (301) 565-8080

PRODUCT DESCRIPTION:

ReQuest II is a menu driven database management program which
does not require any programming knowledge. Menus and prompts
are displayed by reQuest II in multiple, dynamic windows.

Many DBMS tasks are performed in reQuest II using a building
block approach. The user creates different pieces of an
application such as a record selection, a format, or a
calculation, then defines another "piece" which integrates the
others to perform a query, update, or other application.

ReQuest II does not use BTOS ISAM files, but implements its own
file access structure.

DOCUMENTATION/TUTORIAL:

ReQuest II documentation includes a user manual with a tutorial
section. The manual is clearly written and very helpful. The
tutorial section was a little confusing at first. Some
instructions did not seem to apply to the demo software. Also,
the tutorial gave the false impression that the screen display
control parameters, mask and scenario options, would not have to
be changed from the default values to use reQuest II. The values
for these defaults were not found in the documentation.

Hotline support was needed to understand how to use the mask and
scenario options and to correctly perform the summary report.
The hotline support was slow because of unavailable personnel,
but the assistance was good.

FILE STRUCTURE/DATA ENTRY:

Entering the file structure required two steps, creating a
database and defining a file. They were fairly simple processes
that involved answering prompts. Adding, modifying, or deleting
fields was also done in this way.

Creating a data entry screen involved defining a mask and a
scenario to control the screen display. The evaluator had some
difficulty doing this because the manual suggested the default
values be used, which resulted in a display of only ten fields
(the test file includes fifteen fields). Once the hotline
explained the trouble, the evaluator was able to proceed with no
problems.

DATA MANIPULATION:

ReQuest II includes a data import facility which is invoked from the menu. It requires a user to define the ASCII file to be imported. The user defines the import procedure, which can then be invoked from the menu.

Other data manipulation involved: defining a selection of records, a procedure, and calculations as needed. These elements were defined by using menus and following prompts from window to window.

QUERY:

To perform a query, the user must define four elements:

- o   a selection   (defines the records to be selected)
- o   a form   (chooses the fields and lays them out)
- o   a format   (defines general layout and points to form)
- o   a report spec. (identifies the file and the other three elements)

These elements are defined by answering prompts in various windows.

REPORT:

Reports were performed exactly like queries in reQuest II. The summary report in this evaluation also required two formats to be created: one for a page header and one for the fields and totals. The evaluator had some trouble with this report producing a separate summary for each record, but solved the problem with hotline assistance.

SUMMARY:

Strong Points:

- o   Menu driven
- o   Good documentation and helpful hotline support

Weak Points:

- o   Slow response from hotline
- o   Somewhat confusing and tedious with too many steps for even simple procedures

ReQuest II does not require the user to use any programming languages. The evaluators do not recommend this product for novices because it involves too many steps for what should be simple procedures. ReQuest II was among the slowest products in most of the benchmark tests.

ANALYSIS OF PERFORMANCE TEST RESULTS

Tests in six different categories were conducted on each of the participating database products. The six categories were:

1. Data Import
2. Indexing
3. Query
4. Reports
5. Data Manipulation
6. Building an Input Screen

Eleven different tests in the first five categories were timed to measure performance. Building an Input Screen was not timed. Section 2 of this report describes all of the tests and hardware configurations.

Three sample databases were provided by the Coast Guard for use in the evaluation. Test procedures were developed and tested using a 50 record database. Later, the procedures were timed using a 500 record database; and a 5000 record database. Timed tests were run separately on the master and a workstation. Raw data for each series of tests are included in Appendix A.

Tests with results of several seconds were rendered insignificant when summed with tests requiring significantly more time to complete. Consequently, a sum total comparison is meaningless. Others evaluating the data may choose to introduce weighting factors to emphasize those tests that are more important to their needs. Since no weighting factors were specified in the original test plan, it is inappropriate to introduce them at this point in the analysis. To present a fair comparison, we normalized test results based on the fastest recorded time for each test in a particular series.

A hypothetical "ideal product", would achieve the best score in each of the tests. Its average normalized rating would be represented by a bar of magnitude one. As you look at Graphs I-IV, the horizontal bars represent how others compare against the "ideal product".

Fourteen products were considered. Only twelve products are shown on the graphs. Intelligent Query and PRESTO/REPORTER could not perform all of the tests in this evaluation and were not compared with the other products, thereby reducing the evaluated products to twelve. A BTOS II 3.0 protection violation error prevented ADS from being tested on the master. BTOS II 1.1 was used to test ADS on the master.

Graphs I and II show the average normalized times for all the performance tests running on a workstation and the master, respectively. Notice that the diagonally-striped bars for PDS-Adept and Forms Plus extend a good way across the scale. PDS-Adept's solution to one of the data manipulation tests, test V-C-2, went beyond the intent of the bakeoff. Forms Plus was unable to sort on a non-indexed field, test II-A. The large diagonally-striped bar for both products is the result of putting a large number (10,000) in place of a missing data point. A zero score would unfairly benefit the product in the particular test since a low score is most favorable. Large diagonally-striped bars for Forms Plus and PDS-Adept DO NOT represent poor performance!!

The solid bars represent the average normalized results ignoring the tests that PDS-Adept and Forms Plus did not complete. Aside from Forms Plus and PDS-Adept, notice that the order, by performance, does not change; and the magnitude of the bars does not change significantly. Consequently, in the interest of comparing the most products on an equal basis, tests II-A and V-C-2 will be ignored for the remaining discussion. Averages based on only nine of the eleven normalized times will be considered.

Overall performance begins to fall off with the first of the ISAM based products, R:BASE 5000. The performance decrease is more significant on a workstation than on the master.

Graph III shows the average normalized scores of each product's performance on the workstation. The order in Graph III was determined by subjectively fitting the products to a curve. Notice that the general trend is for each product to maintain its relative position in the order of performance as the number of records in the database increases.

The values for the 5000 record series are determined by normalizing the test results on the fastest achievable times for that series. Likewise for the 500 and 50 record database tests. Each bar is a relative comparison against the "ideal product" for a particular size database. In Graphs III and IV, multiple series are plotted together to show that the decline in performance is relatively consistent among the evaluated products. Comparisons between series are not valid. For example, on Graph III, INFORMIX has an average normalized score for the 5000 record database that is approximately double its average normalized score for the 500 record database. It does not mean that the times were twice as fast in the 500 record database tests. However, it does mean INFORMIX came closer to matching the times of the "ideal product" in the 500 record database on a workstation than it did to the "ideal product" running the 5000 record database on a workstation.

Graph IV shows the average normalized scores of each product's performance on the master. Products are graphed in the same order as determined by performance on the workstation. Although the order, based on performance, differs from master to workstation, the differences are relatively insignificant.

The position of Oracle, INFORMIX and PROGRESS on all of the graphs indicates they performed consistently well in our suite of tests. It is interesting to note that each of these advanced database products came to BTOS by way of the UNIX operating system. Each uses a file access method other than ISAM.

R:BASE 5000 is consistently faster than the other ISAM based products. Fasport-dbm is not far behind. Although the order of the remaining products changes somewhat depending on the series, they are consistently in the bottom half indicating poorer performance.

The intent of the bakeoff was to identify the best end-user database product(s). Consistency of the top products and significant performance degradation among those in the bottom half makes the evaluation much simpler.

500 Records on a Workstation

Graph I

Average of Normalized Times

Categories (top to bottom):
- Oracle(Unisys)
- INFORMIX
- Oracle(Oracle)
- PROGRESS
- R:BASE 5000
- Fasport-dbm
- Forms Plus
- ADS
- PDS-Adept
- reQuest
- Paradise
- reQuest II

Legend:
- Without Tests II-A & V-C-2 (solid)
- All Tests (hatched)
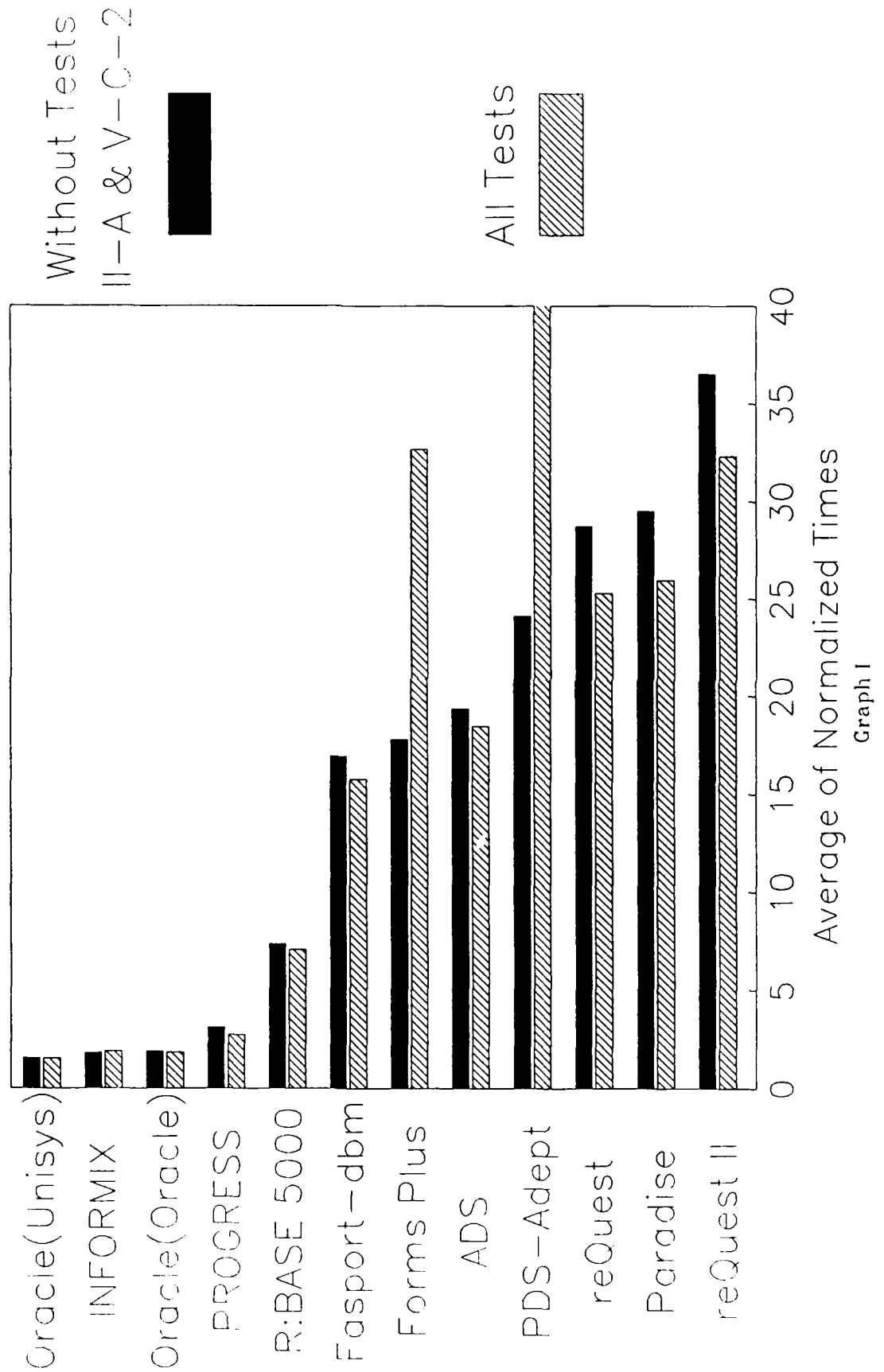
500 Records on the Master

Without Tests
II-A & V-C-2

All Tests

* Tested under BTOS II 1.1

Average of Normalized Times

Graph II

PROGRESS
Oracle(Unisys)
Oracle(Oracle)
INFORMIX
R:BASE 5000
Fasport-dbm
PDS-Adept
Paradise
ADS *
Forms Plus
reQuest
reQuest II
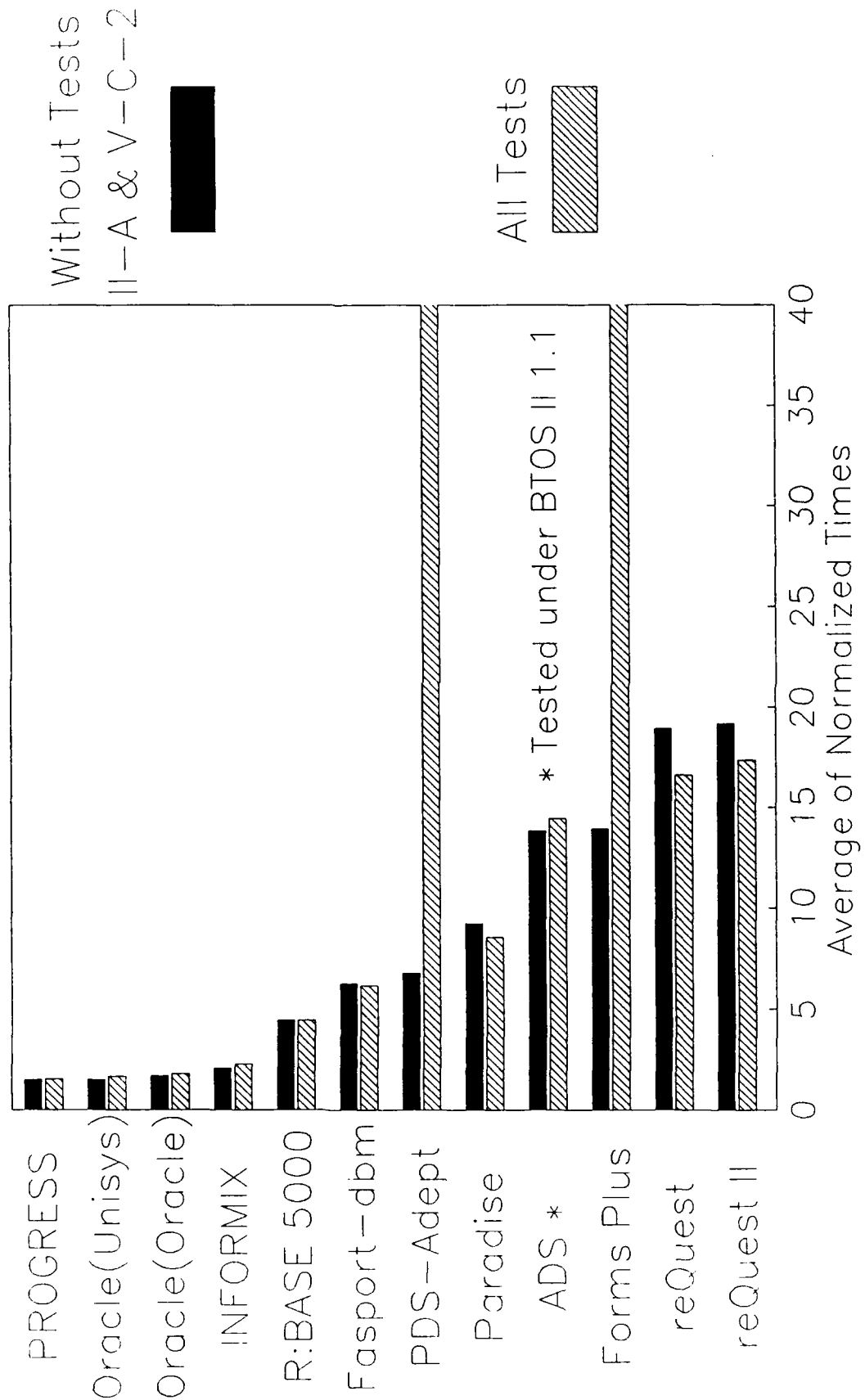
Normalized Test Results -- Workstation
(Minus Tests II-A & V-C-2)

50 Records ▨

500 Records ■

5000 Records ▨

Database
Oracle(Unisys)
Oracle(Oracle)
INFORMIX
PROGRESS
R:BASE 5000
Fasport-dbm
Forms Plus
ADS
PDS-Adept
reQuest
Paradise
reQuest II

Average of Normalized Times

0 5 10 15 20 25 30 35 40
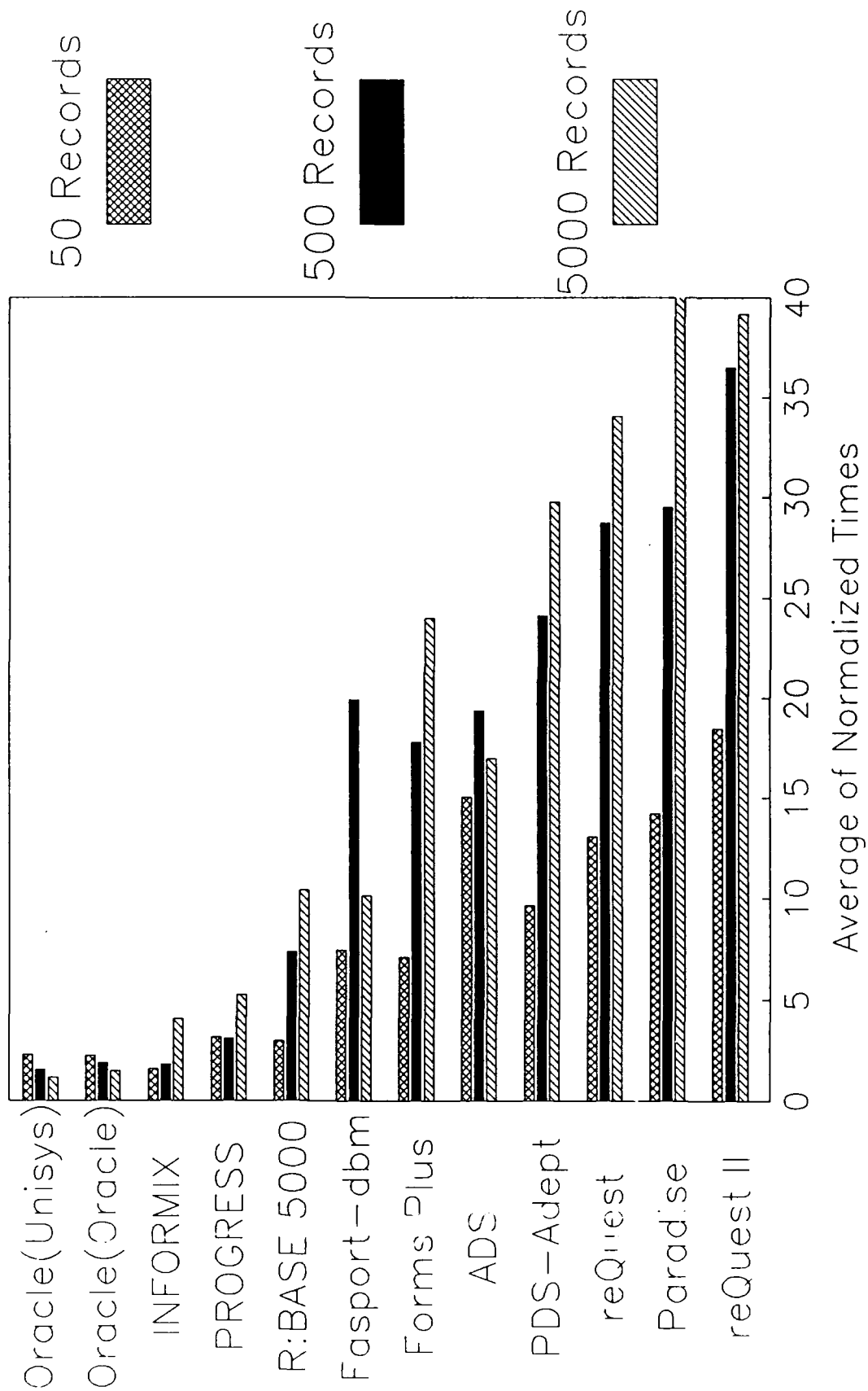
Graph III

Normalized Test Results -- Master

(Minus Tests II-A & V-C-2)

50 Records

500 Records

5000 Records

Oracle(Urisys)
Oracle(Oracle)
INFORMIX
PROGRESS
R:BASE 5000
Fasport-dbm
Forms Plus
ADS *
PDS-Adept
reQuest
Paradise
reQuest II

* Tested under BTOS II 1.1

0   5   10   15   20   25   30   35   40

Average of Normalized Times
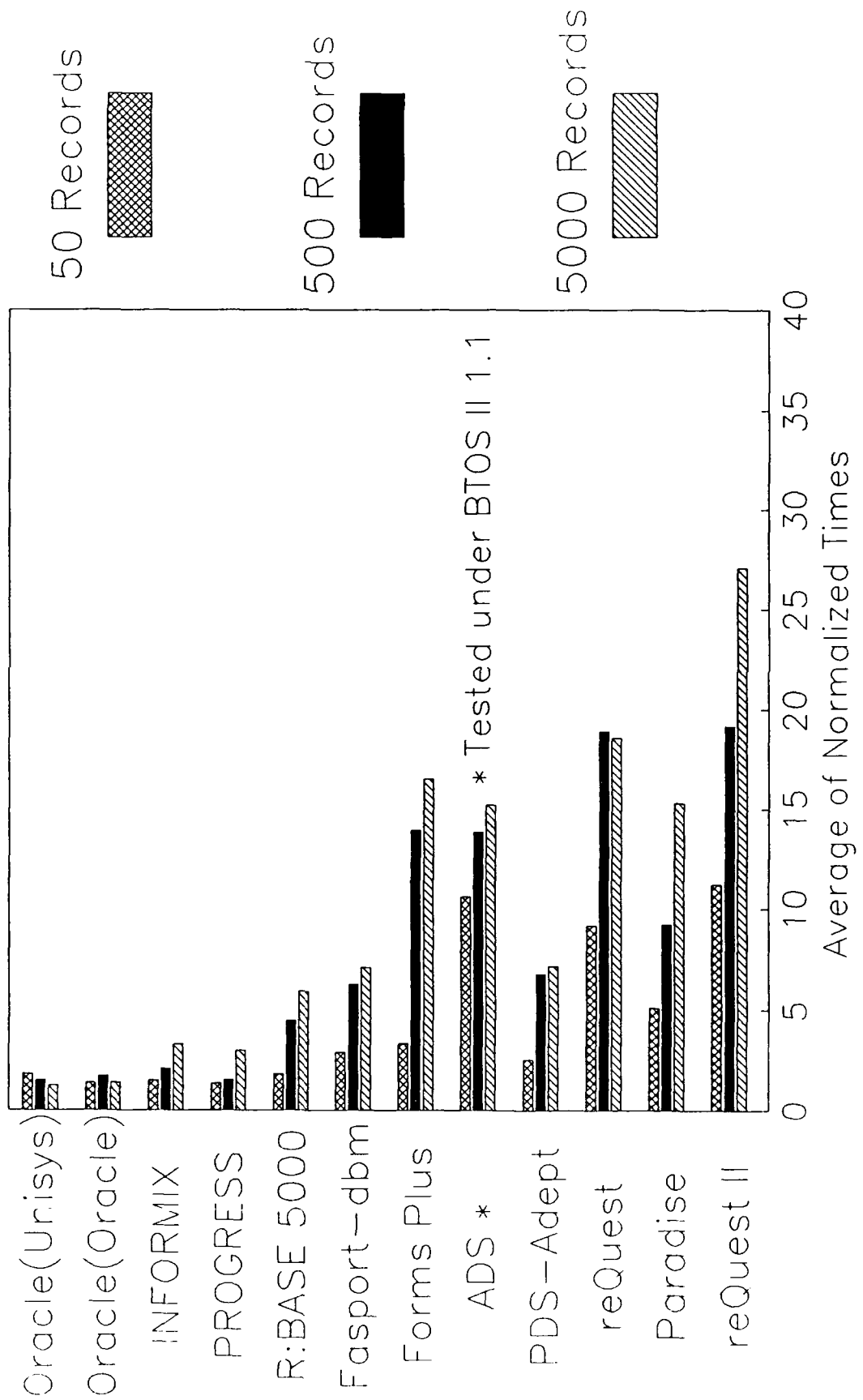
Graph IV

SECTION 3-C
SUBJECTIVE EVALUATION

The Evaluators were asked to do a subjective evaluation of the major characteristics of each product after they had finished the programming tasks for all the products. This allowed them to have the perspective provided by exposure to all the products before making subjective judgments about any one product. The characteristics of documentation, query capability, report capability, general ease of use, and hotline response were rated from 0 (poor) to 5 (excellent). The ratings given by each evaluator were then averaged for each category and appear in the following table. The evaluator averages were added for each product and appear in the column on the right of the table.

The products are ordered with the product with the highest sum at the top of the table. All of the categories have been given equal weights. Different results could have been achieved had the factors been otherwise weighted. We saw no reason to weight any of the factors more or less than any of the others.

Individual graphs for each characteristic evaluation and a summary graph are provided as Graphs V through X (pages 3-C-3 through 3-C-8).

SUBJECTIVE EVALUATION SUMMARY TABLE

	Document	Query	Report	Ease	Hotline	Total
R:BASE 5000	5.0	4.5	4.5	5.0	4.0	23.0
INFORMIX	4.5	4.5	3.5	3.5	5.0	21.0
PROGRESS	3.0	4.5	3.5	4.0	5.0	20.0
Paradise	3.0	3.5	4.5	4.0	4.5	19.5
IQ	1.0	5.0	5.0	3.0	3.0	17.0
reQuest	2.0	3.0	3.5	3.0	3.5	15.0
ADS	3.0	3.0	3.0	1.0	4.0	14.0
PRESTO/REPORTER	1.0	3.0	3.0	3.0	3.0	13.0
Fasport-dbm	1.7	2.3	2.3	3.0	3.0	12.3
Oracle	2.5	4.5	1.0	2.0	1.0	10.0
reQuest II	1.0	1.0	1.0	1.0	3.0	7.0
PDS-Adept	0.5	0.5	3.0	0.5	1.0	5.5
Forms Plus	1.0	0.0	1.0	0.0	3.0	5.0

Subjective Evaluation

Legend: Hotline

INFORMIX
PROGRESS
Paradise
R:BASE 5000
ADS
reQuest
IQ
PRESTO/REPORTER
Fasport-dbm
reQuest II
Forms Plus
Oracle
PDS-Adept
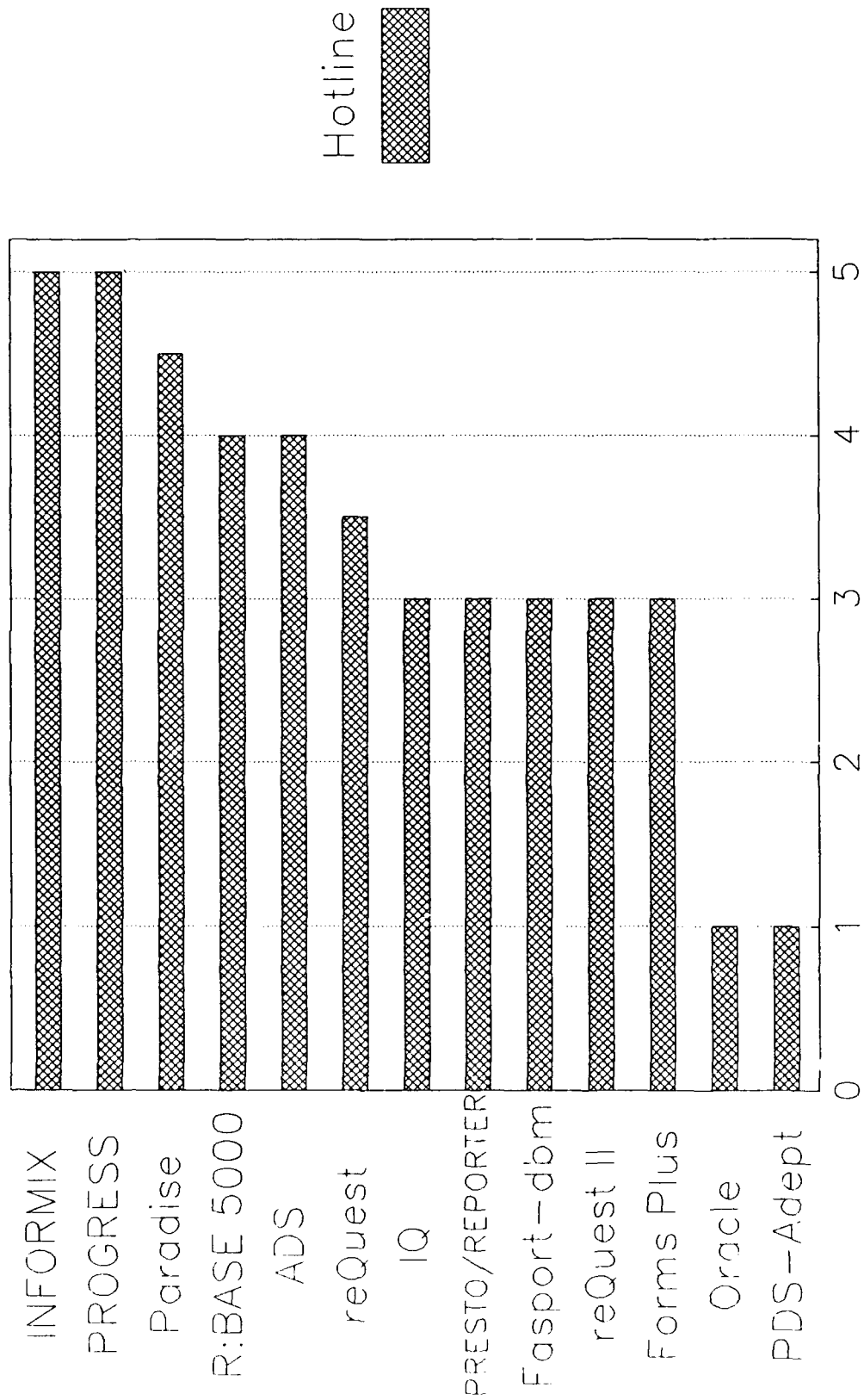
Graph V

Subjective Evaluation

Ease
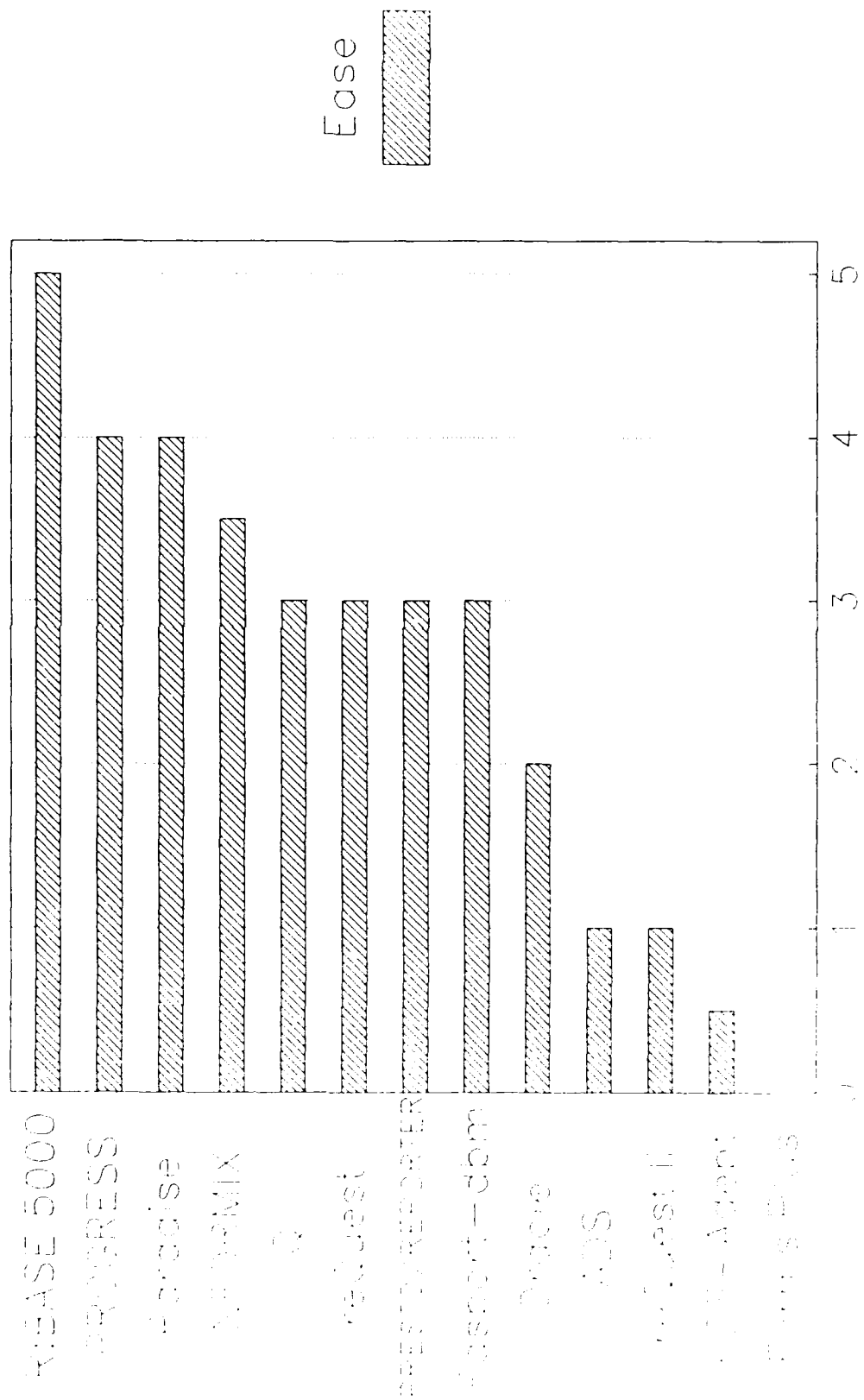
Graph VI

Subjective Evaluation

Report

iQ

R:BASE 5000

Paradise

INFORMIX

PROGRESS

reQuest

ADS

PRESTO/REPORTER

DDS-Adept

Export-dbm

Oracle

reQuest II

Forms Plus
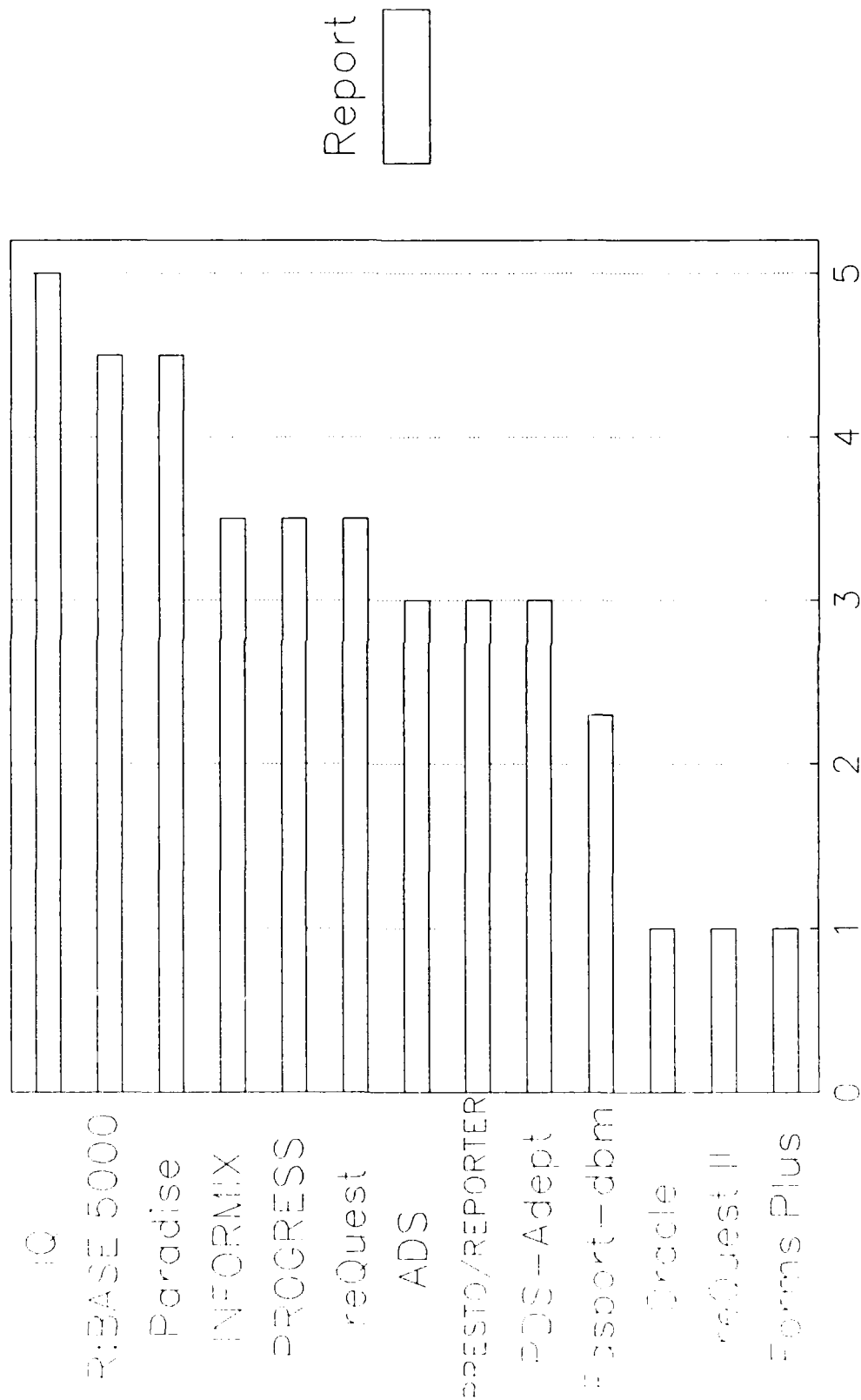
Graph VII

Subjective Evaluation

Query

IQ
R:BASE 5000
INFORMIX
PROGRESS
Oracle
Paradise
reQuest
ADS
PRESTO/REPORTER
Easport-dbm
reQuest II
PDS-Adept
Forms Plus

0   1   2   3   4   5
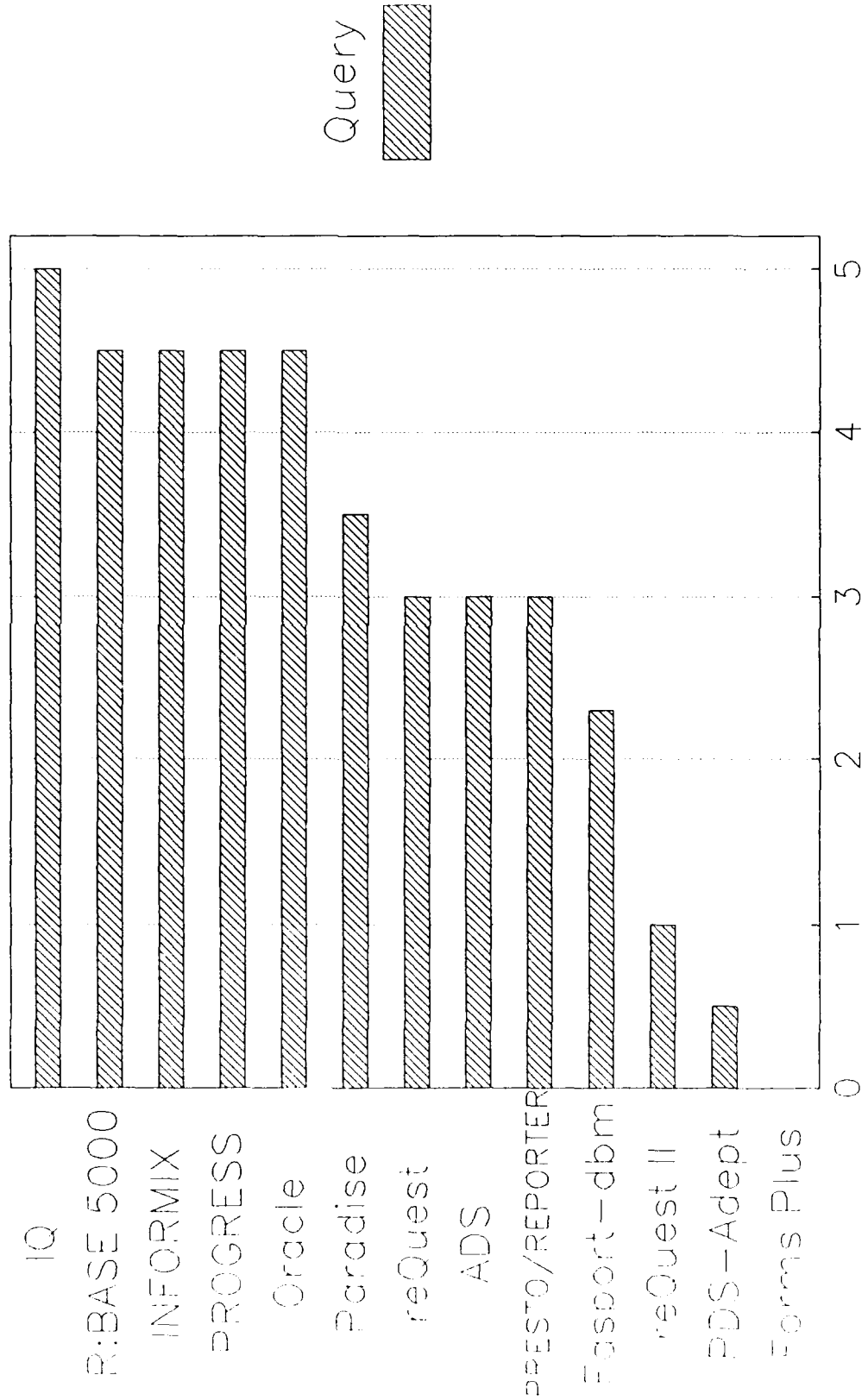
Graph VIII

Subjective Evaluation

Documentation ▮

0	1	2	3	4	5

R:BASE 5000 — 5
INFORMIX — 4.5
PROGRESS — 3
Pcradise — 3
ADS — 3
Oracle — 2.5
reQuest — 2
Fasport—dbm — 1.75
IQ — 1
PRESTO/REPORTER — 1
reQuest II — 1
Forms Plus — 1
PDS—Adept — 0.5
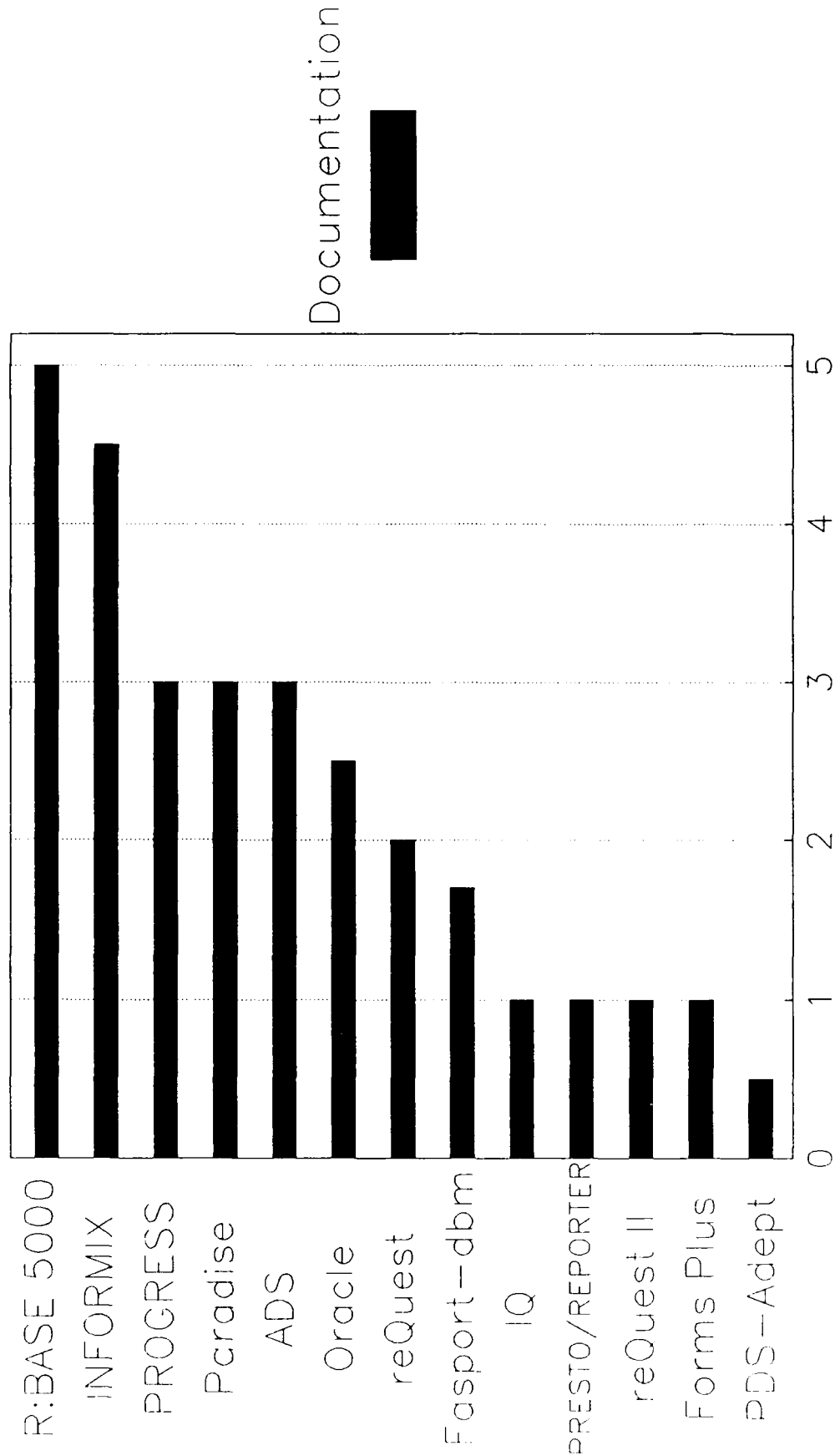
Graph IX

Subjective Evaluation

Hotline
Ease
Report
Query
Documentation

R:BASE 5000
INFORMIX
PROGRESS
Paradise
IQ
reQuest
ADS
PRESTO/REPORTER
Fasort-dbm
Oracle
reQuest II
PDS-Adept
Forms Plus

0   5   10   15   20   25

(Category Scale: 0-5 - Larger is better)
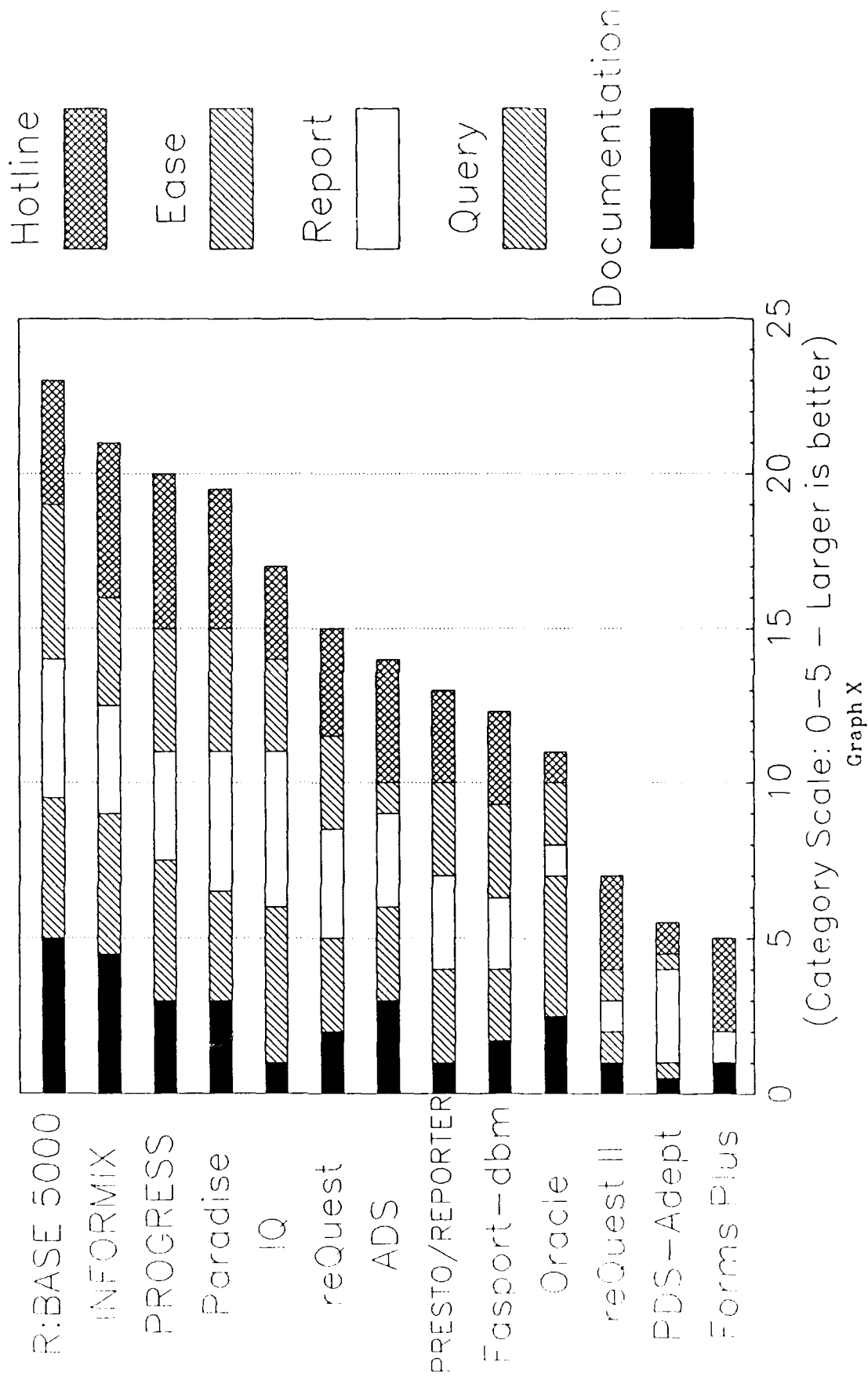
Graph X

SECTION 4
CONCLUSIONS

The results of this database bakeoff were presented in three
areas of this report:

1) Performance Evaluation Graphs (pages 3-B-5 through
   3-B-8)

2) Subjective Evaluation Graphs (pages 3-C-3 through
   3-C-8)

3) Subjective Comments of the Evaluations (pages 3-A-2
   through 3-A-38)

For the performance evaluation, the results were normalized by
dividing the execution time for each of the products by the
fastest achieved time for that particular test. The fastest
product in each test received a normalized score of one. To
assess the overall performance of each product, these normalized
scores were averaged to yield the "average of normalized times"
for each product.

In the case of the subjective evaluations, the subjective scores
given by two separate evaluators were averaged to give a score in
each of the five categories (Graphs V-IX, pages 3-C-3 through
3-C-7). Since we had no justification to weight any category
more than the others, our total subjective scores in Graph X
(page 3-C-8) are simply the sum of the scores in each of the five
areas.

The subjective comments by the evaluators are self explanatory.

The tests themselves were an education for the evaluators and ISC
alike. The test methodology was developed to be used in the
CTOS/BTOS environment where master and cluster workstation
performances were expected to vary. Other than this anomaly, all
of the other parameters have direct applicability to database
comparison in any operating environment. The types of test,
database sizes and performance technique based on the averaging
of normalized performance scores applies to other operating
environments.

DISCUSSION OF RESULTS:

Performance Results

The following discussion steps through the results and places the
products into performance groups. In our analysis, we considered
the breakdown into groups more significant than the actual order
of the products within a group. The groupings are approximate
and are subject to interpretation. It is important to note that
the order in which the products are listed should not be the sole

basis for a decision on the best product. Rather, the total evaluation of a product, including performance, subjective evaluations and the narrative comments, should all be considered in reaching the decision on which product is best for a particular organization and application.

Graph I (page 3-B-4) is a comparison of the average normalized performance scores for each product on a 500 record database running on a cluster workstation. Visual reduction of the data suggests the first four products (both Oracles, INFORMIX, and PROGRESS) fall in the best performance group, R:BASE 5000 in a second best group, and the remaining seven products in a thirdperformance group. Note that the influence of ISAM on the cluster workstation database performance is very dramatic.

Graph II (page 3-B-5) is similar to Graph I except the tests were run on the master workstation. The ISAM performance differences are not so extreme here, demonstrating that ISAM itself is not so bad, but the implementation of it over the cluster causes major performance degradation. Review of this graph suggests the first four products (both Oracles, INFORMIX, and PROGRESS) fall in the best performance group, the next four (R:BASE 5000, Fasport-dbm, PDS-Adept, and Paradise) fall in the second best group, and the remaining three products in a third group.

Graph III (page 3-B-6) presents the average of normalized times for tests conducted on the cluster workstation using 50, 500 and 5000 records databases respectively. Each series (50, 500 and 5000 records) is based on the average normalized scores for that series. Because of this normalization, comparisons between the different database series on a specific product can not be drawn. All three series are plotted on the same graph to allow a comparison of product performance on different sized databases.

The products are arranged in order of visually averaged overall performance in the nine tests which all the products were able to complete. If products were arranged by any single database size, the order would change; but not significantly. Note, the effect of ISAM over the cluster forces the ISAM products down to the bottom of the graph. Groupings here would suggest the first four products (both Oracles, INFORMIX, and PROGRESS) fall in best performance group, the next four (R:BASE 5000, Fasport-dbm, Forms Plus, and ADS) in the second best group, and the final four products in a third group.

Graph IV (page 3-B-7) is similar to Graph III except it is for performance on the master workstation. The ISAM effects are less obvious than on the cluster and the groupings are not so distinct. Products appear in the same order as the workstation tests (Graph III). The first four products (both Oracles, INFORMIX, and PROGRESS) fall in the best performance group; products five, six and nine (R:BASE 5000, Fasport-dbm, and PDS-Adept) in the second best, Paradise falls in a third group by itself, while the remaining products fall into a fourth group group.

The top contenders in performance were all DBMS's ported to CTOS/BTOS from UNIX or VMS. Performance test results varied slightly from test to test but the top four products were typically the same. It should be noted that the cluster performance degradation was no where near as severe on these products as it was on the ISAM based products.

Subjective Results

Graphs V though IX (pages 3-C-3 through 3-C-7) show the results of the evaluators' assessments of the products in the subjective areas; Hotline Support, Ease of Use, Report Capability, Query Capability and Documentation. Groupings are possible in Graph X (page 3-C-8) which presents the total scores of all five subjective areas for each product. Breaking the graph into groups puts two products (R:BASE 5000 and INFORMIX) in the first category, three products (PROGRESS, Paradise, and Intelligent Query) in the second, five products (reQuest, ADS, PRESTO/REPORTER, Fasport-dbm, and Oracle) in the third, and the remaining three products in a fourth category. Once again, the groups are based on simple totals for all of the five areas, since we see no justification for weighting any of them greater or less than the others. However, based upon individual requirements, weighting factors would change the order shown on Graph X (page 3-C-8).

AREAS FOR FURTHER EVALUATION:

Results of EECEN's large cluster controller performance evaluation (EECEN letter 5230, Ser: 109.6W, of 27 October 1989) suggest very little change in the performance of ISAM II over ISAM 8.0 with a single user. Unisys Network Computing Group (NCG) literature, on the other hand, suggests that the multi-threaded capability of ISAM II yields substantially greater performance than ISAM 8.0 in a multi-user environment. Once we get to the point that vendors have modified their products to be completely compatible with BTOS II 3.0 and ISAM II, another round of tests may be in order.

Multi-user performance was not addressed due to our need to define an accomplishable task. Further testing of these database engines with increasing numbers of concurrent users is certainly merited.

(THIS PAGE LEFT INTENTIONALLY BLANK)

APPENDIX A
PERFORMANCE TABLES

This appendix contains the performance test times for each product. There are three times for each test, one from the evaluator, one from the vendor and the best of those two times. Tests were conducted on two different platforms, the master and the cluster workstation, for each database size (50, 500 and 5000 records). Some products performed well in certain tests while not performing well in others. Focusing on the results of an individual test is not necessarily indicative of a product's overall performance. Overall graphs can be found in Section 3-B.

TEST LEGEND

TEST	DESCRIPTION
I	Data Import
II-A	Sorting, non-indexed, ascending
II-B	Reindexing
III-A	Simple Search, 1 record
III-B	Simple Search, multiple records
III-C	Complex Search, multiple records, multiple criteria
IV	Reports
V-A	Deleting records
V-B	Global changes
V-C1	Add a new field
V-C2	Delete a field/attribute

50 record
master
evaluator

	I	II-A	II-B	III-A	III-B	III-C	IV	V-A	V-B	V-C1	V-C2
ADS *b	18	36	38	3	15	27	6	4	7	47	40
PRESTO/REPORTER	*b	*b	*b	*b	*b	*b	*b	*b	*b	*b	*b
Fasport-dbm	6	8	*h	1	1	1	4	3	4	9	*j
Forms Plus	7	*e	9	1	1	*d	4	7	13	8	7
INFORMIX-SQL	4	10	3	1	1	1	2	2	3	10	11
IQ	*g	11	*g	4	4	4	7	*g	*g	*g	*g
Oracle(Oracle)	18	7	2	1	1	1	13	1	1	3	14
Oracle(Unisys)	14	7	2	1	1	1	13	1	1	3	11
Paradise	10	41	21	2	4	3	8	7	8	18	18
PDS-Adept	6	14	13	1	2	2	5	3	4	7	*d
PROGRESS	18	6	2	1	1	2	3	2	3	7	4
R:BASE 5000	6	3	2	1	1	1	12	1	1	10	10
reQuest	15	14	21	2	3	3	60	6	18	36	21
reQuest II	30	12	57	3	5	5	16	14	32	62	90
AVERAGE	13	14	15	2	3	4	12	4	8	18	21
MEDIAN	10	10	9	1	1	2	8	3	4	9	18

- SEE TEST LEGEND ON PAGE A-2
* SEE COMMENTS STARTING ON PAGE A-21

50 record master vendor

vendor	I	II-A	II-B	III-A	III-B	III-C	IV	V-A	V-B	V-C1	V-C2
ADS *b	14	70	36	3	16	29	6	4	8	45	36
PRESTO/REPORTER	*b	*b	*b	*b	*b	*b	*b	*b	*b	*b	*b
Fasport-dbm	15	7	19	3	3	4	18	7	8	20	20
Forms Plus	7	*e	9	1	1	3	11	7	7	9	9
INFORMIX-SQL	4	9	2	1	1	1	3	2	5	7	7
IQ	*c	*c	*c	*c	*c	*c	*c	*c	*c	*c	*c
Oracle(Oracle)	15	5	2	1	1	1	3	1	1	3	21
Oracle(Unisys)	14	6	2	2	2	2	12	1	1	3	11
Paradise	13	14	56	1	4	4	8	7	8	65	56
PDS-Adept	8	5	11	1	2	2	4	3	4	5	*d
PROGRESS	9	5	2	1	1	2	5	1	1	4	3
R:BASE 5000	9	4	2	1	1	1	11	1	1	10	9
reQuest	17	16	21	2	3	3	54	7	16	34	22
reQuest II	35	11	52	2	4	4	12	13	18	64	90
AVERAGE	13	14	18	2	3	5	12	5	7	22	26
MEDIAN	13	7	9	1	2	2	11	3	5	9	20

- SEE TEST LEGEND ON PAGE A-2
* SEE COMMENTS STARTING ON PAGE A-21

50 record
master
best

	I	II-A	II-B	III-A	III-B	III-C	IV	V-A	V-B	V-C1	V-C2
ADS *b	14	36	36	3	15	27	6	4	7	45	36
PRESTO/REPORTER	*b	*b	*b	*b	*b	*b	*b	*b	*b	*b	*b
Fasport-dbm	6	7	19	1	1	1	4	3	4	9	20
Forms Plus	7	*e	9	1	1	3	4	7	7	8	7
INFORMIX-SQL	4	9	2	1	1	1	2	2	3	7	7
IQ	*g	11	*g	4	4	4	7	*g	*g	*g	*g
Oracle(Oracle)	15	5	2	1	1	1	3	1	1	3	14
Oracle(Unisys)	14	6	2	1	1	1	12	1	1	3	11
Paradise	10	14	21	1	4	3	8	7	8	18	18
PDS-Adept	6	5	11	1	2	2	4	3	4	5	*h
PROGRESS	9	5	2	1	1	2	3	1	1	4	3
R:BASE 5000	6	3	2	1	1	1	11	1	1	10	9
reQuest	15	14	21	2	3	3	54	6	16	34	21
reQuest II	30	11	52	2	4	4	12	13	18	62	90
AVERAGE	11	11	15	2	3	4	10	4	6	17	21
MEDIAN	9	7	9	1	1	2	7	3	4	8	14

- SEE TEST LEGEND ON PAGE A-2
* SEE COMMENTS STARTING ON PAGE A-21

50 record workstation evaluator

	I	II-A	II-B	III-A	III-B	III-C	IV	V-A	V-B	V-C1	V-C2
ADS	43	6C	59	8	32	47	14	5	22	68	56
PRESTO/REPORTER	*f	*f	*f	7	20	*d	20	*f	*f	*f	*f
Fasport-dbm	18	15	*i	1	3	2	5	10	15	25	*j
Forms Plus	16	*e	16	2	4	*d	8	17	48	14	16
INFORMIX-SQL	5	13	4	1	2	2	5	2	4	15	7
IQ	*g	20	*g	9	9	9	15	*g	*g	*g	*g
Oracle(Oracle)	34	12	2	2	3	3	28	2	2	4	15
Oracle(Unisys)	26	10	2	2	2	2	28	2	2	4	13
Paradise	26	91	41	8	14	14	20	22	28	40	40
PDS-Adept	42	16	39	1	12	12	16	15	18	23	*d
PROGRESS	36	13	4	2	3	4	6	11	11	20	8
R:BASE 5000	33	6	6	2	2	2	24	3	3	20	16
reQuest†	36	45	39	4	8	9	98	9	28	70	41
reQuest II	88	18	95	8	10	9	30	23	54	106	175
AVERAGE	34	27	28	4	9	10	23	10	20	34	39
MEDIAN	33	15	16	2	4	4	16	9	15	20	16

- — SEE TEST LEGEND ON PAGE A-2
* — SEE COMMENTS STARTING ON PAGE A-21

50 record workstation vendor	I	II-A	II-B	III-A	III-B	III-C	IV	V-A	V-B	V-C1	V-C2
ADS	25	24	55	7	30	15	10	12	22	66	56
PRESTO/REPORTER	*f	*f	*f	8	32	10	13	*f	*f	*f	*f
Fasport-dbm	38	22	46	9	11	10	44	22	24	45	44
Forms Plus	13	*e	19	1	3	6	25	19	20	18	18
INFORMIX-SQL	5	7	2	1	1	1	5	2	3	9	7
IQ	*c	*c	*c	*c	*c	*c	*c	*c	*c	*c	*c
Oracle(Oracle)	34	13	2	3	3	4	5	1	1	4	24
Oracle(Unisys)	26	10	2	2	2	3	27	1	1	3	13
Paradise	27	34	109	7	14	14	20	22	28	140	109
PDS-Adept	35	18	45	4	11	6	15	14	20	22	*h
PROGRESS	26	8	3	2	3	3	8	3	7	7	5
R:BASE 5000	18	8	5	1	1	2	23	3	3	18	14
reQuest	36	34	40	3	7	4	111	8	28	64	39
reQuest II	82	20	88	1	6	7	26	26	35	86	184
AVERAGE	30	18	35	4	10	7	26	11	16	40	47
MEDIAN	26	18	19	3	6	6	20	8	20	18	24

- SEE TEST LEGEND ON PAGE A-2
* SEE COMMENTS STARTING ON PAGE A-21

	I	II-A	II-B	III-A	III-B	III-C	IV	V-A	V-B	V-C1	V-C2
										50 record	workstation best
ADS	25	24	55	7	30	15	10	5	22	66	56
PRESTO/REPORTER	*f	*f	*f	7	20	10	*f	*f	*f	*f	*f
Fasport-dbm	18	15	46	1	3	2	6	10	15	25	44
Forms Plus	13	*e	16	1	3	6	8	17	20	14	16
INFORMIX-SQL	5	7	2	1	1	1	5	2	3	9	7
IQ	*g	20	*g	9	9	9	15	*g	*g	*g	*g
Oracle(Unisys)	26	10	2	2	2	2	27	1	1	3	13
Oracle(Oracle)	34	12	2	2	3	3	5	1	1	4	15
Paradise	26	34	41	7	14	14	20	22	28	40	40
PDS-Adept	35	16	39	1	11	6	15	14	18	22	*d
PROGRESS	26	8	3	2	3	3	6	3	7	7	5
R:BASE 5000	18	6	5	1	1	2	23	3	3	18	14
reQuest	36	34	39	3	7	4	98	8	28	64	39
reQuest II	82	18	88	1	6	7	26	23	35	86	175
AVERAGE	29	17	28	3	8	6	20	9	15	30	39
MEDIAN	26	15	16	2	3	4	13	5	15	18	16

- SEE TEST LEGEND ON PAGE A-2
* SEE COMMENTS STARTING ON PAGE A-21

500 record master evaluator

	I	II-A	II-B	III-A	III-B	III-C	IV	V-A	V-B	V-C1	V-C2
ADS *b	188	289	158	4	45	*k	20	7	45	202	159
PRESTO/REPORTER	*b	*b	*b	*b	*b	*b	*b	*b	*b	*b	*b
Fastport-dbm	64	26	*i	1	4	3	21	10	37	33	*j
Forms Plus	58	*e	73	3	6	*d	30	65	129	67	68
INFORMIX-SQL	30	70	12	1	3	5	9	3	11	42	34
IQ	*g	54	*g	11	10	11	17	*g	*g	*g	*g
Oracle(Oracle)	46	50	4	1	2	6	19	4	9	14	18
Oracle(Unisys)	42	56	4	1	2	3	17	4	7	12	17
Paradise	59	344	80	2	21	47	56	15	34	72	64
PDS-Adept	69	22	74	1	13	15	39	13	27	35	*h
PROGRESS	64	44	9	1	3	8	10	17	25	46	16
R:BASE 5000	74	33	10	1	2	19	102	3	6	73	64
reQuest	126	74	94	2	10	14	586	11	131	199	72
reQuest II	315	75	229	4	15	24	93	27	166	232	143
AVERAGE	105	95	68	3	10	14	78	15	52	86	60
MEDIAN	64	54	73	1	6	11	21	10	27	46	64

- SEE TEST LEGEND ON PAGE A-2
* SEE COMMENTS STARTING ON PAGE A-21

500 record master vendor	I	II-A	II-B	III-A	III-B	III-C	IV	V-A	V-B	V-C1	V-C2
ADS *b	97	638	155	3	45	23	27	9	43	196	156
PRESTO/REPORTER	*b	*b	*b	*b	*b	*b	*b	*b	*b	*b	*b
Fastport-dbm	87	17	84	3	7	6	48	18	32	87	93
Forms Plus	55	*e	75	1	5	27	98	64	70	64	66
INFORMIX-SQL	20	52	12	1	3	4	9	3	11	45	30
IQ	*c	*c	*c	*c	*c	*c	*c	*c	*c	*c	*c
Oracle(Oracle)	45	39	4	1	2	6	7	4	10	16	32
Oracle(Unisys)	43	49	3	2	3	3	16	3	8	13	16
Paradise	68	61	400	2	21	18	55	16	34	411	402
PDS-Adept	64	28	74	1	12	10	26	12	28	30	*h
PROGRESS	47	37	8	1	3	4	22	1	8	11	9
R:BASE 5000	69	37	11	1	2	19	100	3	7	76	65
reQuest	112	94	93	2	10	11	518	11	121	196	95
reQuest II	425	70	226	3	13	24	62	25	91	167	125
AVERAGE	94	102	95	2	10	13	82	14	39	109	99
MEDIAN	64	49	74	1	5	10	27	9	28	64	66

- SEE TEST LEGEND ON PAGE A-2
* SEE COMMENTS STARTING ON PAGE A-21

500 record
master
best

	I	II-A	II-B	III-A	III-B	III-C	IV	V-A	V-B	V-C1	V-C2
ADS *b	97	289	155	3	45	23	20	7	43	196	156
PRESTO/REPORTER	*b	*b	*b	*b	*b	*b	*b	*b	*b	*b	*b
Fastport-dbm	64	17	84	1	4	3	21	10	32	33	93
Forms Plus	55	*e	73	1	5	27	30	64	70	64	66
INFORMIX-SQL	20	52	12	1	3	4	9	3	11	42	30
IQ	*g	54	*g	11	10	11	17	*g	*g	*g	*g
Oracle(Oracle)	45	39	4	1	2	6	7	4	9	14	18
Oracle(Unisys)	42	49	3	1	2	3	16	3	7	12	16
Paradise	59	61	80	2	21	18	55	15	34	72	64
PDS-Adept	64	22	74	1	12	10	26	12	27	30	*h
PROGRESS	47	37	8	1	3	4	10	1	8	11	9
R:BASE 5000	69	33	10	1	2	19	100	3	6	73	64
reQuest	112	74	93	2	10	11	518	11	121	196	72
reQuest II	315	70	226	3	13	24	62	25	91	167	125
AVERAGE	82	66	69	2	10	13	69	13	38	76	65
MEDIAN	59	49	73	1	10	11	21	7	27	42	64

- SEE TEST LEGEND ON PAGE A-2
* SEE COMMENTS STARTING ON PAGE A-21

500 record workstation evaluator	I	II-A	II-B	III-A	III-B	III-C	IV	V-A	V-B	V-C1	V-C2
ADS	229	576	200	9	98	*a	42	9	135	333	199
PRESTO/REPORTER	*f	*f	*f	8	62	*d	134	*f	*f	*f	*f
Fastport-dbm	159	67	*1	1	26	18	51	79	143	142	*j
Forms Plus	152	*e	153	26	26	*d	69	172	367	127	153
INFORMIX-SQL	37	95	14	1	3	5	10	4	12	50	34
IQ	*g	116	*g	32	32	33	38	*g	*g	*g	*g
Oracle(Oracle)	123	76	4	3	4	9	36	4	10	15	21
Oracle(Unisys)	84	69	4	2	3	3	34	4	7	13	17
Paradise	143	736	174	37	94	149	156	93	168	176	179
PDS-Adept	283	103	329	1	81	80	131	69	132	147	*h
PROGRESS	135	73	17	3	10	12	17	56	100	137	35
R:BASE 5000	243	58	25	2	5	32	212	11	17	157	131
reQuest	262	175	213	5	31	28	893	17	288	435	202
reQuest II	778	150	576	9	29	49	225	56	407	555	264
AVERAGE	219	191	155	10	36	38	146	48	149	191	124
MEDIAN	152	95	153	3	26	28	51	17	132	142	131

- SEE TEST LEGEND ON PAGE A-2
* SEE COMMENTS STARTING ON PAGE A-21

500 record workstation vendor	I	II-A	II-B	III-A	III-B	III-C	IV	V-A	V-B	V-C1	V-C2
ADS	150	836	204	7	99	53	57	35	136	241	208
PRESTO/REPORTER	*f	*f	*f	12	32	39	84	*f	*f	*f	*f
Fastport-dbm	224	54	216	9	32	27	176	93	117	244	218
Forms Plus	128	*e	19	1	26	110	260	178	200	182	182
INFORMIX-SQL	31	67	14	1	3	4	11	3	12	45	33
IQ	*c	*c	*c	*c	*c	*c	*c	*c	*c	*c	*c
Oracle(Oracle)	109	71	4	3	4	9	9	4	9	15	37
Oracle(Unisys)	84	68	3	3	4	4	29	3	9	14	17
Paradise	145	195	796	38	95	150	156	92	164	977	787
PDS-Adept	245	123	294	4	80	59	106	83	131	134	*h
PROGRESS	127	62	13	2	6	8	42	5	56	15	11
R:BASE 5000	234	71	20	1	5	31	201	11	16	139	116
reQuest	218	174	185	3	15	13	1065	27	278	428	179
reQuest II	1166	149	558	1	25	46	148	58	216	351	328
AVERAGE	238	170	194	7	33	43	180	49	112	232	192
MEDIAN	145	71	20	3	25	39	106	27	117	139	179

- SEE TEST LEGEND ON PAGE A-2
* SEE COMMENTS STARTING ON PAGE A-21

500 record
workstation
best

	I	II-A	II-B	III-A	III-B	III-C	IV	V-A	V-B	V-C1	V-C2
ADS	150	576	200	7	98	53	42	9	135	241	199
PRESTO/REPORTER	*f	*f	*f	8	32	39	84	*f	*f	*f	*f
Fastport-dbm	159	54	216	1	26	18	51	79	117	142	218
Forms Plus	128	*e	19	1	26	110	69	172	200	127	153
INFORMIX-SQL	31	67	14	1	3	4	10	3	12	45	33
IQ	*g	116	*g	32	32	33	38	*g	*g	*g	*g
Oracle(Oracle)	109	71	4	3	4	9	9	4	9	15	21
Oracle(Unisys)	84	68	3	2	3	3	29	3	7	13	17
Paradise	143	195	174	37	94	149	156	92	164	176	179
PDS-Adept	245	103	294	1	80	59	106	69	131	134	*h
PROGRESS	127	62	13	2	6	8	17	5	56	15	11
R:BASE 5000	234	58	20	1	5	31	201	11	16	139	116
reQuest	218	174	185	3	15	13	893	17	278	428	179
reQuest II	778	149	558	1	25	46	148	56	216	351	264
AVERAGE	201	141	142	7	32	41	132	43	112	152	126
MEDIAN	143	71	20	2	25	31	51	11	117	134	153

- SEE TEST LEGEND ON PAGE A-2
* SEE COMMENTS STARTING ON PAGE A-21

5000 record master evaluator	I	II-A	II-B	III-A	III-B	III-C	IV	V-A	V-B	V-C1	V-C2
ADS	*b 2045	3074	1653	4	351	*k	162	51	411	2059	1722
PRESTO/REPORTER	*b	*b	*b	*b	*b	*b	*b	*b	*b	*b	*b
Fasport-dbm	788	221	*1	1	36	16	205	101	367	296	*j
Forms Plus	777	*e	969	144	146	*d	394	725	1585	782	785
INFORMIX-SQL	348	878	225	1	18	86	76	48	108	531	425
IQ	*g	599	*g	69	70	76	118	*g	*g	*g	*g
Oracle(Oracle)	336	532	26	2	16	60	71	32	85	127	71
Oracle(Unisys)	320	550	26	1	17	54	78	30	77	116	63
Paradise	573	3604	855	39	186	303	536	102	293	635	606
PDS-Adept	668	283	757	1	116	123	381	110	272	314	*h
PROGRESS	646	69.	389	1	165	180	227	405	578	985	397
R:BASE 5000	1872	617	125	1	19	68	1003	114	65	1314	1088
reQuest	1450	631	1002	2	73	62	3005	81	1232	2054	998
reQuest II	3478	768	3215	5	115	220	918	458	1713	2682	622
AVERAGE	1108	1038	840	21	102	113	552	188	566	991	578
MEDIAN	668	617	757	2	73	76	227	101	293	635	606

- SEE TEST LEGEND ON PAGE A-2
* SEE COMMENTS STARTING ON PAGE A-21

5000 record master vendor

vendor	I	II-A	II-B	III-A	III-B	III-C	IV	V-A	V-B	V-C1	V-C2
ADS *b	959	5400	1668	4	348	108	265	64	410	2037	1341
PRESTO/REPORTER	*b	*b	*b	*b	*b	*b	*b	*b	*b	*b	*b
Fasport-dbm	897	89	933	4	37	18	366	138	258	934	959
Forms Plus	615	*e	977	1	137	186	1161	904	992	775	774
INFORMIX-SQL	244	624	222	1	18	83	105	42	106	520	409
IQ	*c	*c	*c	*c	*c	*c	*c	*c	*c	*c	*c
Oracle(Oracle)	336	331	25	2	16	13	54	31	83	140	143
Oracle(Unisys)	323	495	25	12	17	15	45	31	77	117	63
Paradise	832	634	4022	38	181	302	527	106	241	4387	4013
PDS-Adept	664	332	916	1	103	50	246	106	264	268	*h
PROGRESS	422	469	147	1	77	39	259	15	153	158	146
R:BASE 5000	891	549	86	1	16	62	990	114	50	997	896
reQuest	1166	932	1071	2	77	50	5086	58	1191	2116	1113
reQuest II	3422	764	3552	3	112	213	612	403	1010	1623	518
AVERAGE	898	965	1137	6	95	95	810	168	403	1173	943
MEDIAN	664	549	916	2	77	50	265	64	241	775	774

- SEE TEST LEGEND ON PAGE A-2
* SEE COMMENTS STARTING ON PAGE A-21

5000 record
master
best

	I	II-A	II-B	III-A	III-B	III-C	IV	V-A	V-B	V-C1	V-C2
ADS *b	959	3074	1653	4	348	108	162	51	410	2037	1341
PRESTO/REPORTER	*b	*b	*b	*b	*b	*b	*b	*b	*b	*b	*b
Fasport-dbm	788	89	933	1	36	16	205	101	258	296	959
Forms Plus	615	*e	969	1	137	186	394	725	992	775	774
INFORMIX-SQL	244	624	222	1	18	83	76	42	106	520	409
IQ	*g	599	*g	69	70	76	118	*g	*g	*g	*g
Oracle(Oracle)	336	331	25	2	16	13	54	31	83	127	71
Oracle(Unisys)	320	495	25	1	17	15	45	30	77	116	63
Paradise	573	634	855	38	181	302	527	102	241	635	606
PDS-Adept	664	283	757	1	103	50	246	106	264	268	*h
PROGRESS	422	469	147	1	77	39	227	15	153	158	146
R:BASE 5000	891	549	86	1	16	62	990	114	50	997	896
reQuest	1166	631	1002	2	73	50	3005	58	1191	2054	998
reQuest II	3422	764	3215	3	112	213	612	403	1010	1623	518
AVERAGE	867	712	824	10	93	93	512	148	403	801	616
MEDIAN	615	549	757	1	73	62	246	58	241	520	606

- SEE TEST LEGEND ON PAGE A-2
* SEE COMMENTS STARTING ON PAGE A-21

5000 record
workstation
evaluator

	I	II-A	II-B	III-A	III-B	III-C	IV	V-A	V-B	V-C1	V-C2
ADS	1949	5400	1905	6	794	*a	329	63	1286	3152	1883
PRESTO/REPORTER	*f	*f	*f	8	306	*d	1297	*f	*f	*f	*f
Fasport-dbm	1599	520	149	1	250	106	509	822	1368	1286	*h
Forms Plus	1336	*e	1958	264	265	*d	756	1602	3837	1460	1534
INFORMIX-SQL	569	1094	499	1	21	90	81	59	109	605	523
IQ	*g	1249	*g	257	278	284	271	*g	*g	*g	*g
Oracle(Oracle)	876	905	26	4	18	64	88	32	82	124	70
Oracle(Unisys)	580	666	27	2	18	57	95	31	77	120	65
Paradise	1465	5400	1785	324	892	1088	1518	828	1485	1833	1760
PDS-Adept	3199	1234	3321	1	773	773	1272	819	1313	1385	*h
PROGRESS	985	1180	581	3	237	262	398	559	860	1439	583
R:BASE 5000	3608	1024	196	2	41	114	2291	237	147	2130	1855
reQuest	2678	1624	2854	27	261	493	5400	133	2884	4569	2156
reQuest II	5400	1523	5400	15	214	376	2265	677	4075	5400	1188
AVERAGE	2020	1818	1558	65	312	337	1184	489	1460	1959	1162
MEDIAN	1465	1180	581	4	250	262	756	237	1286	1439	1188

- SEE TEST LEGEND ON PAGE A-2
* SEE COMMENTS STARTING ON PAGE A-21

vendor	I	II-A	II-B	III-A	III-B	III-C	IV	V-A	V-B	V-C1	V-C2
ADS	1374	5400	1884	14	302	228	545	286	1236	1920	1908
PRESTO/REPORTER	*f	*f	*f	7	305	221	821	*f	*f	*f	*f
Fasport-dbm	2122	372	2141	9	272	115	1529	833	1064	2311	2150
Forms Plus	1300	*e	1882	1	267	376	2538	1849	1851	1829	1792
INFORMIX-SQL	404	1097	499	1	20	85	106	49	109	527	413
IQ	*c	*c	*c	*c	*c	*c	*c	*c	*c	*c	*c
Oracle(Oracle)	865	890	26	10	18	16	57	32	84	137	151
Oracle(Unisys)	645	726	26	2	18	16	58	31	77	121	66
Paradise	1436	1968	5400	323	895	1095	1516	834	1531	5400	5400
PDS-Adept	2533	1379	3262	4	774	329	1025	832	1286	1275	*h
PROGRESS	842	901	322	2	158	79	562	35	383	343	311
R:BASE 5000	3522	1036	194	2	38	109	2267	233	138	2085	1823
reQuest	2707	2018	2088	4	256	112	5400	111	2744	4468	2036
reQuest II	5400	1526	5400	1	212	374	1517	499	2046	3141	1030
AVERAGE	1929	1574	1927	29	272	243	1380	469	1046	1963	1553
MEDIAN	1374	1097	1882	4	256	115	1025	233	1064	1829	1792

- SEE TEST LEGEND ON PAGE A-2
* SEE COMMENTS STARTING ON PAGE A-21

5000 record workstation best

	I	II-A	II-B	III-A	III-B	III-C	IV	V-A	V-B	V-C1	V-C2
ADS	1374	5400	1884	6	302	228	329	63	1236	1920	1883
PRESTO/REPORTER	*f	*f	*f	7	305	221	821	*f	*f	*f	*f
Fasport-dbm	1599	372	149	1	250	106	509	822	1064	1286	2150
Forms Plus	1300	*e	1882	1	265	376	756	1602	1851	1460	1534
INFORMIX-SQL	404	1094	499	1	20	85	81	49	109	527	413
IQ	*g	1249	*g	257	278	284	271	*g	*g	*g	*g
Oracle(Oracle)	865	890	26	4	18	16	57	32	82	124	70
Oracle(Unisys)	580	666	26	2	18	16	58	31	77	120	65
Paradise	1436	1968	1785	323	892	1088	1516	828	1485	1833	1760
PDS-Adept	2533	1234	3262	1	773	329	1025	819	1286	1275	*h
PROGRESS	842	901	322	2	158	79	398	35	383	343	311
R:BASE 5000	3522	1024	194	2	38	109	2267	233	138	2085	1823
reQuest	2678	1624	2088	4	256	112	5400	111	2744	4468	2036
reQuest II	5400	1523	5400	1	212	374	1517	499	2046	3141	1030
AVERAGE	1878	1495	1460	44	270	245	1072	427	1042	1549	1189
MEDIAN	1374	1094	499	2	250	112	509	111	1064	1286	1534

- SEE TEST LEGEND ON PAGE A-2
* SEE COMMENTS STARTING ON PAGE A-21

NOTES TO PERFORMANCE TIMINGS

KEY   **EXPLANATION**

*a   Evaluator chose to use Ad Hoc Inquiry utility. This
             utility did not support the complexity of the selection
             criteria.

*b   ADS and PRESTO/REPORTER can only be executed from a
             clustered workstation under BTOS II 3.0. Times for ADS
             on the master were obtained running under BTOS II 1.1.

*c   IQ chose not to submit vendor solutions.

*d   Evaluator was unable to complete this test.

*e   Forms Plus does not support non-indexed sorting.

*f   PRESTO/REPORTER supports only queries and reports.

*g   IQ supports only sorts, queries, and reports.

*h   Used a database design technique to accomplish this
             test vice actually deleting the field, the field's
             data, restructuring the database, and saving the new
             structure (e.g., the procedure used did not meet the
             intent of the test). Times for master tests were
             approximately 2 seconds. Times for workstation tests
             were approximately 5 seconds.

*i   Used an executive command outside the scope of the
             product. The BTOS ISAM ReOrganize command was used to
             accomplish this test.

             Master Test Results:
                 50   Record - 13 seconds
                 500   Record - 23 seconds
                 5000 Record - 40 seconds

             Workstation Test Results:
                 50   Record - 31 seconds
                 500   Record - 41 seconds
                 5000 Record - 149 seconds

KEY	EXPLANATION

*j   Used a database design technique to accomplish this test vice actually deleting the field, the field's data, restructuring the database, and saving the new structure (e.g., the procedure used did not meet the intent of the test).

Master Test Results:
    50   Record - 6 seconds
    500   Record - 6 seconds
    5000 Record - 6 seconds

Workstation Test Results:
    50   Record - 9 seconds
    500   Record - 9 seconds
    5000 Record - 9 seconds

*k   Did not complete test.

APPENDIX B
FUNCTIONAL CAPABILITIES TABLES

This appendix outlines the functional capabilities of the database packages evaluated in this project. The information was provided by the vendors. The data is shown in tabular form to enable an end-user to make a quick comparison of the database packages. Any questions relating to this outline should be directed to the vendors. Addresses and phone numbers are listed in the report.

FUNCTIONAL CAPABILITIES TABLE

	Program Type			Program Environment	
	Relational	Hierarchial	Other	Memory Required (KB)	Disk Space Required
ADS	YES	NO	NONE	396K	2.97MB
Fasport-dbm	YES	NO	NONE	290K	1.79MB
Forms Plus	YES	NO	*2	512K	0.61MB
INFORMIX-SQL	YES	NO	NONE	452K	2.31MB
Intelligent Query	NO	NO	*3	512K	0.51MB
Oracle (Oracle)	YES	NO	NONE	1704K *4	15.00MB *4
Oracle (Unisys)*1	YES	YES	NONE	1576K *5	4.50MB *6
Paradise	YES	NO	NONE	400K	1.80MB
PDS-Adept	NO	YES	NONE	400K	1.27MB
PRESTO/REPORTER	YES	NO	NONE	800K	2.10MB
PROGRESS	YES	NO	NONE	500K-800K	8.00MB
R:BASE 5000	YES	NO	NONE	512K	1.00MB
reQuest	YES	NO	NONE	512K	2.87MB
reQuest II	YES	NO	NONE	768K	3.00MB

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

	Capable of Protected Mode Operations	Program Environment (cont'd) -----Support of OGENs-----			Access Method	Other
		Support AWS	Support IWS/MWS	Support 186 NGEN		
ADS	YES	YES	YES	YES	ISAM	NONE
Fasport-dbm	NO	YES	YES	YES	*9	NONE
Forms Plus	YES	YES	YES	YES	ISAM	*15
INFORMIX-SQL	YES	NO	NO	YES	C-ISAM	*16
Intelligent Query	NO	YES	YES	YES	*10	NONE
Oracle (Oracle)	YES	NO	NO	YES *8	*11	NONE
Oracle (Unisys)	YES	NO	NO	YES	B-TREE	NONE
Paradise	YES	YES	YES	YES	ISAM	NONE
PDS-Adept	YES	YES	YES	YES	SAM/ISAM	NONE
PRESTO/REPORTER	YES	NO	NO	YES	ISAM	NONE
PROGRESS	YES	NO	NO	YES	*12	NONE
R:BASE 5000	NO	YES	YES	YES	ISAM *13	NONE
reQuest	NO *7	YES	YES	YES	ISAM	NONE
reQuest II	NO	NO	NO	YES	*14	NONE

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

File Structure Limits

	Field Size (characters)	Fields per Record	Fields per Database	Record Size (bytes)	Records per Datafile
ADS	64,000	4,096	NO LIMIT	64,000	NO LIMIT
Fasport-dbm	NO LIMIT	NO LIMIT	NO LIMIT	NO LIMIT	NO LIMIT
Forms Plus	NO LIMIT	600	NO LIMIT	65,000	NO LIMIT
INFORMIX-SQL	32,000	NO LIMIT	NO LIMIT	32,000	NO LIMIT
Intelligent Query	9,999	NO LIMIT	NO LIMIT	2 BILLION	NO LIMIT
Oracle (Oracle)	65,535	254	NO LIMIT	126,495	NO LIMIT
Oracle (Unisys)	240	254	*18	126,000	250,000,000
Paradise	76	150	30,000	4,000	NO LIMIT
PDS-Adept	80	99	NO LIMIT	1,016	NO LIMIT
PRESTO/REPORTER	*17	4,096	NO LIMIT	64,000	NO LIMIT
PROGRESS	32,000	32,000	32,736,000	32,000	NO LIMIT
R:BASE 5000	1,500	382	400	1,530	50,000,000
reQuest	4,080	4,096	32,767	4,096	NO LIMIT
reQuest II	32,767	2,000	510,000	32,767	32,767

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

	File Structure Limits (cont'd)			Data Field Types (Max sizes)	
	# Datafiles Per Database	Records per Database	Other	Character (characters)	Long Text (characters)
ADS	NO LIMIT	NO LIMIT	NONE	64,000	64,000
Fasport-dbm	98	NO LIMIT	*19	NO LIMIT	N/A
Forms Plus	NO LIMIT	NO LIMIT	*20	PAGE WIDTH	ONE PAGE
INFORMIX-SQL	NO LIMIT	NO LIMIT	NONE	32,000	NO
Intelligent Query	NO LIMIT	NO LIMIT	NONE	N/A	N/A
Oracle (Oracle)	NO LIMIT	NO LIMIT	NONE	255	65,535
Oracle (Unisys)	8,000	*18	*21	240	65,535
Paradise	200	NO LIMIT	*22	76	78
PDS-Adept	NO LIMIT	NO LIMIT	NONE	80	80
PRESTO/REPORTER	NO LIMIT	NO LIMIT	NONE	64,000	64,000
PROGRESS	1,023	NO LIMIT	NONE	32,000	32,000
R:BASE 5000	40	50,000,000	NONE	1,500	1,500
reQuest	100	2 BILLION	NONE	80	4,080
reQuest II	255	8,300,000	NONE	32,767	32,767

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

Data Field Types (Max Sizes) (cont'd)

	Integers (digits)	Fixed Decimal	Floating Point	Dollar	Date	Time	System Date
ADS	8	19	12	19	10	NO	10
Fasport-dbm	16	16	15 *29	16	6	*7	6
Forms Plus	9	9	16	16	8	6	NO
INFORMIX-SQL	*23	32	*30	*32	10	NO	10
Intelligent Query	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Oracle (Oracle)	40	40	40	NO	*35	7	*35
Oracle (Unisys)	*24	40	40	NO	*36	12	18
Paradise	17	16	16	*33	8	N/A	8
PDS-Adept	4	12	12	NO	6	12	6
PRESTO/REPORTER	8	8	12	19	10	NO	10
PROGRESS	*25	*27	*27	42	*37	*25	*37
R:BASE 5000	*26	NO	*31	*34	*38	*40	4
reQuest	15	*28	NO	*28	*39	NO	*39
reQuest II	18	9	NO	18	8	NO	8

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

Data Field Types (Max sizes) (cont'd)

	System Time	Boolean	Decimal Accuracy	Characters Per Field Name	Characters Per File Name		Other
ADS	8	NO	>16	31	92		*46
Fasport-dbm	*7	N/A	16	15	20		*47
Forms Plus	NO	NO	12.6	32	50		NONE
INFORMIX-SQL	8	*42	*44	18	18		*48
Intelligent Query	N/A	N/A	N/A	N/A	N/A		NONE
Oracle (Oracle)	7	100E64	42	30	30		*49
Oracle (Unisys)	12	1	40	30	30		*49
Paradise	*33	N/A	8	15	15		*50
PDS-Adept	12or6	NO	12	12	30	*45	*51
PRESTO/REPORTER	8	NO	>16	31	31		*46
PROGRESS	*25	1	10	12	12		NONE
R:BASE 5000	4	1	6	8	8		*52
reQuest	*41	*43	14	32	32		*53
reQuest II	NO	1	9	15	15		*54

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

Data Field Attributes

	Range Testing	Date Checking	Time Checking	Validate by Mathematical Expression	Default Values	User-Definable Field Mask
ADS	YES	YES	YES	YES	YES	YES
Fasport-dbm	YES	YES	*7	YES	YES	YES
Forms Plus	YES	YES	YES	NO	YES	NO
INFORMIX-SQL	YES	YES	NO	YES	YES	YES
Intelligent Query	N/A	N/A	N/A	N/A	N/A	N/A
Oracle (Oracle)	YES	YES	YES	YES	YES	YES
Oracle (Unisys)	YES	YES	YES	YES	YES	YES
Paradise	YES *55	YES	NO	YES *55	YES *55	YES
PDS-Adept	YES *56	YES	YES *56	YES *56	YES *56	NO
PRESTO/REPORTER	YES	YES	*57	YES	*57	YES
PROGRESS	YES	YES	YES	YES	YES	YES
R:BASE 5000	YES	YES	YES	YES	YES	LIMITED*58
reQuest	YES	YES	NO	NO	YES	YES
reQuest II	YES	YES	NO	YES	YES	YES

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

Data Field Attributes (cont'd)

	User-specified Decimal Places	Specific Value Checking	Stored Lookup Table	Override Stored Lookup Table	Virtual Table Lookup	Lookup Verification In Another Table
ADS	YES	YES	YES	YES	YES	YES
Fasport-dbm	YES	YES	NO	N/A	YES	YES
Forms Plus	NO *59	YES	NO	NO	NO	NO
INFORMIX-SQL	YES	YES	YES	NO *60	YES	YES
Intelligent Query	N/A	N/A	N/A	N/A	N/A	N/A
Oracle (Oracle)	YES	YES	YES	YES	YES	YES
Oracle (Unisys)	YES	YES	YES	YES	YES	YES
Paradise	YES	YES *55	YES*55	YES *55	YES	YES
PDS-Adept	YES	YES *56	YES*56	YES *56	YES *56	YES
PRESTO/REPORTER	YES	YES	YES	*57	*57	YES
PROGRESS	YES	YES	YES	YES	YES	YES
R:BASE 5000	NO	YES	YES	NO	NO	YES
reQuest	YES	YES	YES	NOT SURE	NOT SURE	YES
reQuest II	YES	YES	YES	NOT SURE	NOT SURE	NOT SURE

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

Data Field Attributes (cont'd)

	Lookup in 'Include' List	Auto. Data Entry from Lookup Table	Double- Entry Verification	Requires All Fields to be Filled	Forced Uppercase Option	Date Format Conversion
ADS	YES	YES	YES	YES	YES	YES
Fasport-dbm	NO	YES	YES	YES	NO	YES
Forms Plus	NO	NO	NO	YES	NO	YES
INFORMIX-SQL	YES	YES	YES	*61	YES	YES
Intelligent Query	N/A	N/A	N/A	N/A	N/A	N/A
Oracle (Oracle)	YES	YES	YES	YES	YES	YES
Oracle (Unisys)	YES	YES	YES	YES	YES	YES
Paradise	YES *55	YES	YES	YES *61	YES	YES
*PDS-Adept	NO	YES	YES *56	YES	*56	YES *62
PRESTO/REPORTER	YES	*57	*57	*57	YES	YES
PROGRESS	YES	YES	YES	YES	YES	YES
R:BASE 5000	NO	NO	YES	YES	YES	YES
reQuest	NOT SURE	NOT SURE	NOT SURE	YES	YES	NOT SURE
reQuest II	NOT SURE	NOT SURE	NOT SURE	YES	YES	YES

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

Data Field Attributes (cont'd)

	Automatic Incrementing Fields	Unique Fields	Protect From Update	Fixed Values For Data Entry Fields	Calculated Fields on Entry Screen	Calculated Fields on Entry Screen	Calculated Fields per Table
ADS	YES	YES	YES	YES	YES		YES
Fasport-dbm	YES	YES	NO *7	YES	YES		NO
Forms Plus	YES	*63	NO	YES	YES		600
INFORMIX-SQL	YES	YES	YES	YES	YES		YES
Intelligent Query	N/A	N/A	N/A	N/A	N/A		N/A
Oracle (Oracle)	YES	YES	YES	YES	YES		YES
Oracle (Unisys)	YES	YES	YES	YES	YES		NO LIMIT
Paradise	YES *55	YES	YES	YES	YES		140
PDS-Adept	YES	NO	YES	YES *56	YES	*56	YES
PRESTO/REPORTER	*57	YES	YES	*57	*57		YES
PROGRESS	NO	YES	YES	YES	YES		YES
R:BASE 5000	NO	YES	YES	YES	YES		NO
reQuest	YES	NOT SURE	YES	NOT SURE	YES		YES
reQuest II	YES	NOT SURE	YES	NOT SURE	YES		32,767

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

Data Field Attributes (cont'd)

	Carry-over From Previous Record	Error Handling	Data Dictionary/ Catalog	User-accessible Data Dictionary	Other
ADS	YES	YES	YES	YES	NONE
Fasport-dbm	YES	YES	YES	YES	*65
Forms Plus	YES	*64	YES	YES	*66
INFORMIX-SQL	NO *60	YES	YES	YES	NONE
Intelligent Query	N/A	N/A	N/A	N/A	NONE
Oracle (Oracle)	YES	YES	YES	YES	NONE
Oracle (Unisys)	YES	YES	YES	YES	NONE
Paradise	YES *55	YES	YES	YES	*67
PDS-Adept	YES	YES *56	NO	NO	NONE
PRESTO/REPORTER	*57	*57	YES	YES	NONE
PROGRESS	YES	YES	YES	YES	NONE
R:BASE 5000	NO	YES	YES	NO	NONE
reQuest	YES	NO	YES	YES	*68
reQuest II	YES	YES	YES	YES	*69

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

Data Import/Export

	Import DIF	Export DIF	Import SYLK	Export SYLK	Import ASCII	Export ASCII	Import Other	Export Other
ADS	NO	NO	NO	YES	YES	YES	ALL	ALL
Fasport-dbm	NO	NO	NO	YES	*70	*70	NONE	*78
Forms Plus	NO	YES	NO	NO	NO	NO	*71	*79
INFORMIX-SQL	YES	YES	YES	YES	YES	YES	*72	*72
Intelligent Query	NO	YES	NO	YES	NO	YES	NO	*80
Oracle (Oracle)	YES	NO	YES	NO	YES	YES	*73	NONE
Oracle (Unisys)	NO	NO	NO	NO	YES	YES	NONE	NONE
Paradise	NO	NO	YES	YES	YES	YES	*74	*81
PDS-Adept	NO	NO	YES*56	YES*56	YES	YES	NONE	NONE
PRESTO/REPORTER	NO	NO	NO	YES	*57	YES	*57	*57
PROGRESS	YES	YES	YES	YES	YES	YES	*75	NONE
R:BASE 5000	NO	YES	NO	YES	YES	YES	*76	*76
reQuest	NO	NO	NO	YES	YES	YES	NONE	*82
reQuest II	NO	YES	NO	YES	YES	YES	*77	*83

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

Data Manipulation

	Max # of Indexes	Max Characters Per Index	Max # of Indexing Fields	Max # of Compound Indexes	Ascend/Descend Multi-field Indexes	Unique Index Value
ADS	100	64	NO LIMIT	NO LIMIT	YES	YES
Fasport-dbm	9	64	9	9	NO	YES
Forms Plus	5	64	5	0	NO	YES
INFORMIX-SQL	NO LIMIT	120	8	NO LIMIT	YES	YES
Intelligent Query	N/A	N/A	N/A	N/A	N/A	N/A
Oracle (Oracle)	NO LIMIT	NO LIMIT	16	16	YES	YES
Oracle (Unisys)	NO LIMIT	240	16	16	YES	YES
Paradise	9	40	9	9	ASCENDING ONLY	YES
PDS-Adept	99	64	*84	99	YES	YES
PRESTO/REPORTER	100	64	NO LIMIT	NO LIMIT	YES	YES
PROGRESS	1023	127	10	1023	YES	YES
R:BASE 5000	400	1536	400	NO	NO	YES
reQuest	16	32	16	1	YES	*85
reQuest II	255	30	255/FILE	NO	ASCENDING ONLY	YES

* SEE NOTES STARTING ON PAGE B-45

	Allows Foreign Index	Automatic Index Maintenance	Composite Key Contiguous Requirement	Data Manipulation (cont'd) -Table Revision		Without Data Loss-	
				Add New Field	Delete Fields	Change Field Lengths	Change Field Types
ADS	YES	YES	YES	YES	YES	YES	YES
Fasport-dbm	YES	YES	YES	YES*88	YES	NO	NO
Forms Plus	NO	YES	NO	YES	YES	YES	NO
INFORMIX-SQL	YES	YES	NO	YES	YES	YES	YES
Intelligent Query	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Oracle (Oracle)	YES	YES	NO	YES	YES	YES	YES
Oracle (Unisys)	YES *86	YES	NO	YES	YES	YES	YES
Paradise	NO	YES	NO	YES	YES	YES	YES
PDS-Adept	NO	NO	YES *87	YES*89	NO	NO	YES*90
PRESTO/REPORTER	YES	YES	YES	*57	*57	*57	*57
PROGRESS	YES	YES	NO	YES	YES	YES	YES
R:BASE 5000	NO	YES	NO	YES	YES	YES	YES
reQuest	NOT SURE	NOT SURE	YES	YES	YES	YES	YES
reQuest II	NOT SURE	NOT SURE	NO	YES	YES	YES	YES

* SEE NOTES STARTING ON PAGE B-45

BTOS DATABASE EVALUATION

FUNCTIONAL CAPABILITIES TABLE

| | ---Table Revision | | Data Manipulation Without Data Loss---- | | Data Manipulation (cont'd) | | |
	Change Field Names	Redefine Index Fields	Redefine Calculation Fields	Change Form Design	Global Search and Delete	Global Search and Update
ADS	YES	YES	NO	YES	YES	YES
Fasport-dbm	YES	YES *91	YES	YES	YES *92	YES *92
Forms Plus	NO	YES	YES	YES	NO	NO
INFORMIX-SQL	YES	YES	NO	YES	YES	YES
Intelligent Query	N/A	N/A	N/A	N/A	N/A	N/A
Oracle (Oracle)	YES	YES	YES	YES	YES	YES
Oracle (Unisys)	YES	YES	YES	YES	YES	YES
Paradise	YES	YES	YES	YES	YES	YES
PDS-Adept	YES	NO	NO	YES	NO	NO
PRESTO/REPORTER	*57	*57	*57	*57	*57	*57
PROGRESS	YES	YES	N/A	YES	YES	YES
R:BASE 5000	YES	YES	NO	YES	YES *93	YES
reQuest	NO	YES	YES	YES	YES	YES
reQuest II	YES	YES	YES	YES	YES	YES

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

Data Manipulation (cont'd)

	Global Search and Merge	Math Updates	Text Updates	Max # Tables Open	Max # Tables In Use	UNION	INTERSECTION
ADS	YES	YES	YES	32,000	32,000	YES	YES
Fasport-dbm	YES *92	YES	YES	12	NO LIMIT	N/A	N/A
Forms Plus	YES	NO	NO	7	7	YES	NO
INFORMIX-SQL	YES	YES	YES	NO LIMIT	NO LIMIT	YES	YES
Intelligent Query	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Oracle (Oracle)	YES	YES	YES	NO LIMIT	NO LIMIT	YES	YES
Oracle (Unisys)	YES	YES	YES	*94	*95	YES	YES
Paradise	YES	YES	YES	8	200	YES	YES
PDS-Adept	NO	NO	NO	11	11	N/A	N/A
PRESTO/REPORTER	*57	*57	*57	32,000	255	YES	YES
PROGRESS	YES	YES	YES	1023	127	YES	YES
R:BASE 5000	YES	YES	YES	40	40	YES	YES
reQuest	NOT SURE	YES	YES	100	100	*96	*97
reQuest II	NOT SURE	YES	YES	10	10	YES	YES

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

Data Manipulation (cont'd)

	DIFFERENCE	Max Key Fields Per Join	Max # Tables Per Join	Max # Tables Per View	Max # Tables Per Union	Max # Table per Intersection
ADS	NO	100	128	128	N/A	N/A
Fasport-dbm	N/A	N/A	N/A	NO LIMIT	N/A	N/A
Forms Plus	NO	1	6	6	0	5
INFORMIX-SQL	YES	NO LIMIT	NO LIMIT	NO LIMIT	NO LIMIT	NO LIMIT
Intelligent Query	N/A	N/A	N/A	N/A	N/A	N/A
Oracle (Oracle)	YES	NO LIMIT	NO LIMIT	NO LIMIT	NO LIMIT	NO LIMIT
Oracle (Unisys)	YES	NO LIMIT	NO LIMIT	NO LIMIT	NO LIMIT	NO LIMIT
Paradise	YES	1	200	NO LIMIT	8	8
PDS-Adept	N/A	N/A	N/A	N/A	N/A	N/A
PRESTO/REPORTER	NO	100	128	128	N/A	N/A
PROGRESS	NO	10	1023	1023	1023	1023
R:BASE 5000	YES	NO LIMIT	2	NONE	2	2
reQuest	*98	NOT SURE	NOT SURE	NOT SURE	NOT SURE	NOT SURE
reQuest II	YES	NOT SURE	NOT SURE	NOT SURE	NOT SURE	NOT SURE

* SEE NOTES STARTING ON PAGE B-45

Data Manipulation (cont'd)

	Max # Append Tables	Join Using Expressions	Chain Relational Operators	Forms Access Multiple Tables	Generate Reports from Relational Expression
ADS	N/A	NO	NO	YES	NO
Fasport-dbm	N/A	N/A	N/A	YES	N/A
Forms Plus	NONE	NO	NO	YES	YES
INFORMIX-SQL	NO LIMIT	YES	YES	YES	YES
Intelligent Query	N/A	N/A	N/A	N/A	N/A
Oracle (Oracle)	NO LIMIT	YES	YES	YES	YES
Oracle (Unisys)	NONE	YES	YES	YES	YES
Paradise	8	YES	YES	YES	YES
PDS-Adept	N/A	N/A	N/A	N/A	N/A
PRESTO/REPORTER	N/A	NO	NO	YES	NO
PROGRESS	1023	YES	YES	YES	YES
R:BASE 5000	2	YES	NO	YES	YES
reQuest	NOT SURE	NOT SURE	NOT SURE	YES	NO
reQuest II	NOT SURE	NOT SURE	NOT SURE	YES	NO

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

Data Manipulation (cont'd)

	Generate Tables From Relational Expression	Sub-Language Similar to Calculus	Forbids Duplicate Key Values	Record Order Insignificant	Other
ADS	NO	NO	*99	YES	NONE
Fasport-dbm	N/A	N/A	YES	YES	*100
Forms Plus	YES	NO	YES	YES	*101
INFORMIX-SQL	YES	YES	YES	YES	*102
Intelligent Query	N/A	N/A	N/A	N/A	NONE
Oracle (Oracle)	YES	NO	YES	YES	NONE
Oracle (Unisys)	YES	YES	YES	YES	NONE
Paradise	YES	YES	OPTIONAL	YES	*103
PDS-Adept	N/A	N/A	N/A	N/A	NONE
PRESTO/REPORTER	NO	NO	*57	YES	NONE
PROGRESS	YES	YES	YES	YES	NONE
R:BASE 5000	YES	NO	YES	YES	*104
reQuest	NO	NO	YES	NOT SURE	NONE
reQuest II	NO	NO	YES	NOT SURE	NONE

* SEE NOTES STARTING ON PAGE B-45

Sorting

	Permanent	Temporary (Duration of Command)	Sorts On Any Field	Sorts on Indexed Fields Only	Max. Sort Levels	Max. Levels Simultaneously
ADS	NO	YES	YES	NO	20	20
Fasport-dbm	NO	YES	YES	NO	NO LIMIT	9
Forms Plus	YES	YES	NO	YES	1	1
INFORMIX-SQL	YES	YES	YES	NO	8	8
Intelligent Query	NO	YES	YES	N/A	NO LIMIT	NO LIMIT
Oracle (Oracle)	YES	YES	YES	YES	NO LIMIT	NO LIMIT
Oracle (Unisys)	NO	*105	YES	NO	*106	*106
Paradise	YES	YES	YES	NO	*107	6
PDS-Adept	YES	YES	YES	NO	6	6
PRESTO/REPORTER	NO	YES	YES	NO	20	20
PROGRESS	YES	YES	YES	NO	10	10
R:BASE 5000	NO	YES	YES	NO	10	10
reQuest	NO	YES	YES	NO	8	8
reQuest II	NO	YES	YES	NO	25	25

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

Sorting (cont'd)

	Max. Characters Sort Field	Descending Sorts	Simultaneous Ascending/ Descending	Sort to Original Table	Sort To New Table	Sort To Report
ADS	64	YES	YES	YES	YES	YES
Fasport-dbm	64	YES	YES	NO	YES*92	YES
Forms Plus	64	NO	NO	YES	YES	YES
INFORMIX-SQL	120	YES	YES	YES	YES	YES
Intelligent Query	NO LIMIT	YES	YES	NO	NO	YES
Oracle (Oracle)	255	YES	YES	YES	YES	YES
Oracle (Unisys)	240	YES	YES	NO	NO	YES
Paradise	*108	NO	NO	NO	YES*55	YES
PDS-Adept	64	NO	NO	NO	NO	YES
PRESTO/REPORTER	64	YES	YES	N/A	N/A	YES
PROGRESS	127	YES	YES	YES	YES	YES
R:BASE 5000	1500	YES	YES	NO	YES	YES
reQuest	32	YES	YES	NO	NO	YES
reQuest II	9999	YES	YES	NO	NO	YES

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

	Sorting (cont'd)		Search Parameters				
	Sort on Calculated Field	Other	First Occurrences	All Occurrences	Multiple Fields (max #)	Whole Word	Based On Relation
ADS	YES	NONE	YES	YES	100	YES	YES
Fasport-dbm	NO *109	*110	YES	YES	12	YES	N/A
Forms Plus	YES	*111	YES	YES	4	YES	NO
INFORMIX-SQL	YES	NONE	YES	YES	NO LIMIT	YES	YES
Intelligent Query	YES	NONE	YES	YES	NO LIMIT	YES	YES
Oracle (Oracle)	YES	NONE	YES	YES	NO LIMIT	YES	YES
Oracle (Unisys)	YES	NONE	YES	YES	NO LIMIT	NO	YES
Paradise	NO	NONE	YES	YES	*113	YES	YES
PDS-Adept	NO	NONE	YES *56	YES *56	NO LIMIT	NO	N/A
PRESTO/REPORTER	YES	NONE	YES	YES	100	YES	YES
PROGRESS	N/A	NONE	YES	YES	NO LIMIT	YES	YES
R:BASE 5000	NO	NONE	NO	YES	10	YES	NO
reQuest	NO	*112	NO	YES	132	YES	NOT SURE
reQuest II	YES	NONE	NO	YES	25	YES	YES

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

Search Parameters (cont'd)

	Based on Expressions	Based on Constants	Based on Equality	Based on Inequality	Based on Range	Using an 'Include' List
ADS	YES	YES	YES	YES	YES	YES
Fasport-dbm	YES	YES	YES	YES	YES	YES
Forms Plus	NO	YES	YES	YES	YES	YES
INFORMIX-SQL	YES	YES	YES	YES	YES	YES
Intelligent Query	YES	YES	YES	YES	YES	YES
Oracle (Oracle)	YES	YES	YES	YES	YES	YES
Oracle (Unisys)	YES	YES	YES	YES	YES	YES
Paradise	YES	YES	YES	YES	YES	YES
PDS-Adept	YES *56	YES	YES	NO	YES	NO
PRESTO/REPORTER	YES	YES	YES	YES	YES	YES
PROGRESS	YES	YES	YES	YES	YES	YES
R:BASE 5000	YES	YES	YES	YES	YES	NO
reQuest	YES	YES	YES	YES	YES	YES
reQuest II	YES	YES	YES	YES	YES	NOT SURE

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

	Wild Cards Or Partial Keys	Search Parameters (cont'd) ------Boolean------			Compound Boolean	Multiple Criteria on One Field	Using Parentheses
		Using AND	Using OR	Using NOT			
ADS	YES	YES	YES	YES	YES	YES	YES
Fasport-dbm	NO *7	NO	NO	NO	NO	YES	NO
Forms Plus	NO	NO	NO	NO	NO	YES	NO
INFORMIX-SQL	YES	YES	YES	YES	YES	YES	YES
Intelligent Query	YES	YES	YES	YES	YES	YES	YES
Oracle (Oracle)	YES	YES	YES	YES	YES	YES	YES
Oracle (Unisys)	YES	YES	YES	YES	YES	YES	YES
Paradise	YES	YES	YES	YES	YES	YES	NO
PDS-Adept	YES	YES	NO	NO	NO	NO	NO
PRESTO/REPORTER	YES	YES	YES	YES	YES	YES	YES
PROGRESS	YES	YES	YES	YES	YES	YES	YES
R:BASE 5000	YES	YES	YES	NO	YES	YES	NO
reQuest	YES	YES	YES	NO	YES	YES	NO
reQuest II	YES	YES	YES	NO	YES	YES	NO

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

	Search Parameters (cont'd)				Browsing		
	Case-Sensitive	Case-Insensitive	On Non-Indexed Fields	Other	Start Anywhere In Table	Selected Records Only	Start at First Record
ADS	YES	YES	YES	NONE	YES	YES	YES
Fasport-dbm	YES	NO *7	YES	*114	YES	YES	YES *118
Forms Plus	NO	YES	YES	*115	YES	YES	YES
INFORMIX-SQL	YES	NO	YES	NONE	YES	YES	YES
Intelligent Query	NO	YES	YES	NONE	N/A	N/A	N/A
Oracle (Oracle)	YES	YES	YES	*116	YES	YES	YES *119
Oracle (Unisys)	YES	YES	YES	YES	NO	YES	NO
Paradise	YES	YES	YES	*117	YES	YES	YES
PDS-Adept	NO	YES	YES	NONE	YES	NO	YES
PRESTO/REPORTER	YES	YES	YES	NONE	YES	YES	YES
PROGRESS	YES	YES	YES	NONE	YES	YES	YES
R:BASE 5000	YES	YES	YES	NONE	YES	YES	YES
reQuest	YES	YES	YES	NONE	YES	YES	YES
reQuest II	YES	YES	YES	NONE	YES	YES	YES

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

| | Browsing (cont'd) | | | | | Query Facilities ------Query Language------ | | |
	Display Next Record	Display Previous Record	Go to Record Number	Start at First of Index Order	Other	Pro-prietary	SQL-Compatible (level)	Other
ADS	YES	YES	YES	YES	NONE	YES	NO	NONE
Fasport-dbm	YES	NO	YES*118	YES	*122	YES	NO	*125
Forms Plus	YES	NO	YES	YES	*123	NO	NO	*126
INFORMIX-SQL	YES	YES	YES	YES	NONE	NO	ANSI 1.0	NONE
Intelligent Query	N/A	N/A	N/A	N/A	NONE	YES	NO	NONE
Oracle (Oracle)	YES	YES	*120	YES	NONE	*124	LEVEL 2	NONE
Oracle (Unisys)	YES	YES	YES	YES	NONE	NO	LEVEL 2	NONE
Paradise	YES	NO	NO	YES	NONE	YES	*7	*117
PDS-Adept	YES	NO	NO	YES	NONE	YES	NO	NONE
PRESTO/REPORTER	YES	*57	*57	YES	NONE	YES	NO	NONE
PROGRESS	YES	YES	YES	YES	NONE	YES	ANSI 1.0	NONE
R:BASE 5000	YES	YES	YES	YES	NONE	YES	NO	NONE
reQuest	YES	NO	NO	*121	NONE	YES	NO	NONE
reQuest II	YES	YES	NO	YES	NONE	YES	NO	NONE

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

Query Facilities (cont'd)

	Query By Example	Query By Forms	Multiple File Access	Query Editor Support	Stored Queries	Other	Mathematical Functions -Arithmetic Functions- Numeric	Date	Time
ADS	NO	YES	YES	YES	YES	NONE	YES	YES	YES
Fasport-dbm	NO	YES	YES	NO *7	YES	NONE	YES	YES	NO*7
Forms Plus	NO	NO	NO	NO	NO	NONE	YES	NO	NO
INFORMIX-SQL	YES	YES	YES	YES	YES	NONE	YES	YES	NO
Intelligent Query	NO	NO	YES	YES	YES	NONE	YES	YES	NO
Oracle (Oracle)	NO	YES	YES	YES	YES	NONE	YES	YES	YES
Oracle (Unisys)	YES	YES	YES	YES	YES	NONE	YES	YES	YES
Paradise	NO	YES	YES	YES	YES	NONE	YES	YES	YES
PDS-Adept	NO	NO	YES	NO	YES	NONE	YES	YES	YES
PRESTO/REPORTER	NO	NO	YES	YES	YES	NONE	YES	YES	NO
PROGRESS	NO	YES	YES	YES	YES	NONE	YES	YES	YES
R:BASE 5000	NO	YES	NO	NO	NO	*127	YES	YES	YES
reQuest	YES	NO	YES	NOT SURE	YES	NONE	YES	YES	NO
reQuest II	YES	YES	YES	NOT SURE	YES	NONE	YES	YES	NO

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

| | Mathematical Functions (cont'd) | | | | | | |
| | Comparisons | | | | Exponential Functions | Trigonometric Functions | Financial Functions |
	Numeric	String	Date	Time			
ADS	YES	YES	YES	YES	YES	NO	NO
Fasport-dbm	YES	YES	YES	NO*7	NO	NO	NO
Forms Plus	YES	NO	NO	NO	NO	NO	NO
INFORMIX-SQL	YES	YES	YES	NO	NO	NO	NO
Intelligent Query	YES	YES	YES	NO	NO	NO	NO
Oracle (Oracle)	YES	YES	YES	YES	YES	YES	NO
Oracle (Unisys)	YES	YES	YES	YES	YES	NO	NO
Paradise	YES	YES	YES	YES	YES	YES	YES
PDS-Adept	YES	YES	YES	YES	NO	NO	NO
PRESTO/REPORTER	YES	YES	YES	NO	YES	NO	NO
PROGRESS	YES	YES	YES	YES	YES	YES *128	YES *128
R:BASE 5000	YES	YES	YES	YES	NO	NO	NO
reQuest	YES	YES	YES	NO	YES	NO	NO
reQuest II	YES	YES	YES	NO	YES	NO	NO

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

	Totals	Sub-total	Mathematical Functions (cont'd) Aggregate Functions Average	Count	Maximum	Minimum	Virtual Calculated Field	Other
ADS	YES	YES	YES	YES	YES	YES	YES	NONE
Fasport-dbm	YES	YES	YES *92	YES*92	YES *92	YES *92	YES	NONE
Forms Plus	YES	YES	NO	NO	YES	YES	N/A	*129
INFORMIX-SQL	YES	YES	YES	YES	YES	YES	YES	NONE
Intelligent Query	YES	YES	YES	YES	YES	YES	YES	NONE
Oracle (Oracle)	YES	YES	YES	YES	YES	YES	YES	*130
Oracle (Unisys)	YES	YES	YES	YES	YES	YES	YES	NONE
Paradise	YES	YES	YES *55	YES	YES *55	YES *55	YES	NONE
PDS-Adept	YES	YES	YES *56	YES	YES *56	YES *56	YES	NONE
PRESTO/REPORTER	YES	YES	YES	YES	YES	YES	YES	NONE
PROGRESS	YES	YES	YES	YES	YES	YES	YES	NONE
R:BASE 5000	YES	YES	YES	YES	YES	YES	NO	NONE
reQuest	YES	YES	YES	YES	YES	YES	NOT SURE	NONE
reQuest II	YES	YES	YES	YES	YES	YES	NOT SURE	NONE

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

	Statistics			Command Strategy				
	Standard Deviation	Variance	Other	Static Menus	Dynamic Menus	Typed Command	Mouse Support	Other
ADS	NO	NO	NONE	YES	YES	YES	NO	NONE
Fasport-dbm	NO	NO	NONE	NO	YES	YES	NO	NONE
Forms Plus	NO	NO	NONE	YES	YES	NO	NO	*133
INFORMIX-SQL	NO	NO	NONE	YES	YES	YES	NO	NONE
Intelligent Query	NO	NO	NONE	NO	YES*132	YES	NO	NONE
Oracle (Oracle)	YES	YES	NONE	*131	NO	YES	YES	NONE
Oracle (Unisys)	YES	NO	NONE	NO	NO	NO	NO	NONE
Paradise	YES *55	YES *55	NONE	YES	YES	YES	NO	NONE
PDS-Adept	NO	NO	NONE	YES	YES	YES	NO	NONE
PRESTO/REPORTER	NO	NO	NONE	YES	YES	YES	NO	NONE
PROGRESS	YES	YES	NONE	YES	YES	YES	NO	NONE
R:BASE 5000	NO	NO	NONE	YES	YES	YES	NO	NONE
reQuest	NO	NO	NONE	YES	NO	YES	NO	NONE
reQuest II	NO	NO	NONE	YES	NO	NO	*7	NONE

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

	Macros				Input Facilities		
	Automatic Recording	Keystroke Macro	Macro Language	Other	Max # of Forms Per Table	Max # of Screens Per Form	Max # of Files per Screen
ADS	NO	NO	NO	*134	NO LIMIT	NO LIMIT	NO LIMIT
Fasport-dbm	NO	NO	NO	NONE	NO LIMIT	1	12
Forms Plus	YES	NO	NO	NONE	NO LIMIT	NO LIMIT	6
INFORMIX-SQL	NO	NO	NO	NONE	NO LIMIT	NO LIMIT	NO LIMIT
Intelligent Query	NO	NO	NO	NONE	N/A	N/A	N/A
Oracle (Oracle)	YES	YES	YES	NONE	NO LIMIT	NO LIMIT	NO LIMIT
Oracle (Unisys)	YES	YES	YES	NONE	NO LIMIT	NO LIMIT	NO LIMIT
Paradise	NO	NO	YES	NONE	NO LIMIT	*135	*136
PDS-Adept	N/A	N/A	N/A	NONE	NO LIMIT	10	11
PRESTO/REPORTER	NO	NO	NO	*134	*57	*57	*57
PROGRESS	NO	YES	YES	NONE	NO LIMIT	NO LIMIT	127
R:BASE 5000	NO	NO	YES	NONE	NO LIMIT	1	1
reQuest	NO	NO	NO	*134	NO LIMIT	5	LIMITED
reQuest II	YES	NO	NO	NONE	32,767	1	255

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

	Painting	User-specified Field Placement	Automatic Field Name Placement	Automatic Field Repetition	Text Placed Anywhere On Screen
ADS	YES	YES	YES	YES	YES
Fasport-dbm	YES	YES	YES	YES	YES
Forms Plus	YES	YES	NO	NO	YES
INFORMIX-SQL	NO	YES	YES	NO	YES
Intelligent Query	N/A	N/A	N/A	N/A	N/A
Oracle (Oracle)	YES	YES	YES	YES	YES
Oracle (Unisys)	YES	YES	YES	YES	YES
Paradise	YES	YES	N/A	YES	YES
PDS-Adept	YES	NO	YES	NO	YES
PRESTO/REPORTER	*57	*57	*57	*57	*57
PROGRESS	YES	YES	YES	YES	YES
R:BASE 5000	YES	YES	YES	NO	YES
reQuest	YES	YES	YES	NOT SURE	YES
reQuest II	YES	YES	YES	NOT SURE	YES

Input Facilities (cont'd)
-----Screen Definition-----

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

	Input Facilities (cont'd) -Screen Definition- User-definable Menu Screens	Other	Multiple-File Reports	Output Facilities Max. Report Width	Page Breaks	Control Breaks Per Page
ADS	YES	NONE	YES	YES	YES	YES
Fasport-dbm	YES	*137	YES	250	YES	9
Forms Plus	NO	*138	YES	14 IN	YES	NO
INFORMIX-SQL	YES	NONE	YES	NO LIMIT	YES	YES
Intelligent Query	N/A	NONE	YES	NO LIMIT	YES	YES
Oracle (Oracle)	YES	NONE	YES	500	YES	YES
Oracle (Unisys)	NO	NONE	YES	500	YES	YES
Paradise	YES	*139	YES	256	YES	YES
PDS-Adept	YES	NONE	YES	240	YES	YES
PRESTO/REPORTER	*57	NONE	YES	255	YES	YES
PROGRESS	YES	NONE	YES	255	YES	YES
R:BASE 5000	YES	NONE	YES	131	YES	10
reQuest	NOT SURE	NONE	YES	132	YES	8
reQuest II	YES	NONE	YES	255	YES	25

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

Output Facilities (cont'd)

	One Record Per Page	Form Letter Reports	Columnar Reports	User-Specified Decimal Places	Print Commas	Field Masking	Automatic Page Numbering
ADS	YES	YES	YES	YES	YES	YES	YES
Fasport-dbm	YES	YES	YES	YES	YES	YES	YES
Forms Plus	YES	YES	YES	YES	YES	NO	YES
INFORMIX-SQL	YES	YES	YES	YES	YES	YES	YES
Intelligent Query	YES	YES	YES	YES	YES	YES	YES
Oracle (Oracle)	YES	YES	YES	YES	YES	YES	YES
Oracle (Unisys)	YES	YES	YES	YES	YES	YES	YES
Paradise	YES	YES	YES	NO	YES	YES	YES *55
PDS-Adept	YES	YES	YES	YES	YES	YES	YES
PRESTO/REPORTER	YES	YES	YES	YES	YES	YES	YES
PROGRESS	YES	YES	YES	YES	YES	YES	YES
R:BASE 5000	YES	YES	YES	YES	YES	YES	YES
reQuest	YES	YES	YES	YES	YES	YES	YES
reQuest II	YES	YES	YES	YES	NOT SURE	YES	NO

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

Output Facilities (cont'd)

	Print Current Date	Right-Justified Fields		Left-Justified Fields		Center-Justified Fields	Headers	Footers	Summary Reports
ADS	YES	YES		YES		YES	YES	YES	YES
Fasport-dbm	YES	YES	*140	YES	*141	NO	YES	YES	YES
Forms Plus	YES	YES		YES		NO	YES	YES	YES
INFORMIX-SQL	YES	YES		YES		YES	YES	YES	YES
Intelligent Query	YES	YES	*140	YES	*141	NO	YES	YES	YES
Oracle (Oracle)	YES	YES		YES		YES	YES	YES	YES
Oracle (Unisys)	YES	YES		YES		YES	YES	YES	YES
Paradise	YES	YES	*140	YES	*141	NO	YES	YES	YES
PDS-Adept	YES	YES		YES		YES	YES	NO	YES
PRESTO/REPORTER	YES	YES		YES		YES	YES	YES	YES
PROGRESS	YES	YES		YES		YES	YES	YES	YES
R:BASE 5000	YES	NO		NO		NO	YES	YES	YES
reQuest	YES	YES		YES		NO	YES	YES	YES
reQuest II	NO	YES		YES		NO	YES	YES	YES

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

	Suppress Repeating Column Labels	Output Facilities (cont'd) --Report Definition Method--				
		Painting	Forms Duplication	Automatic	Predefined Mailing Labels	Programmable
ADS	YES	YES	YES	NO	YES	YES
Fasport-dbm	YES	YES	YES	LIMITED*142	YES	YES
Forms Plus	NO	YES	YES	NO	YES	YES
INFORMIX-SQL	YES	NO	NO	YES	YES	YES
Intelligent Query	YES	YES	NO	YES	NO	YES
Oracle (Oracle)	YES	NO	YES	YES *143	NO	YES
Oracle (Unisys)	NO	NO	NO	NO	NO	NO
Paradise	YES	YES	YES	YES	NO	YES
PDS-Adept	NO	NO	NO	NO	NO	YES
PRESTO/REPORTER	N/A	NO	YES	YES	YES	NO
PROGRESS	YES	YES	YES	YES	YES	YES
R:BASE 5000	N/A	YES	NO	YES	NO	NO
reQuest	YES	YES	NO	YES	YES	NOT SURE
reQuest II	NO	YES	NO	NO	YES	NOT SURE

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

	----Report Definition Method----			Output Facilities (cont'd) --Output Destination--			
	Stored Report Definitions	Line-Based	Form-Based	Printer	Screen	Disk	Other
ADS	YES	YES	YES	YES	YES	YES	*144
Fasport-dbm	YES	NO	YES	YES	YES	YES	*145
Forms Plus	YES	NO	YES	YES	YES	YES	*146
INFORMIX-SQL	YES	YES	NO	YES	YES	YES	NONE
Intelligent Query	YES	YES	YES	YES	YES	YES	NONE
Oracle (Oracle)	YES	YES	YES	YES	YES	YES	*147
Oracle (Unisys)	YES	YES	NO	YES	YES	YES	NONE
Paradise	YES	YES	YES	YES	YES	YES	*148
PDS-Adept	YES	YES	YES	YES	YES	YES	NONE
PRESTO/REPORTER	YES	YES	NO	YES	YES	YES	NONE
PROGRESS	YES	YES	YES	YES	YES	YES	*149
R:BASE 5000	YES	NO	NO	YES	YES	YES	*150
reQuest	YES	NOT SURE	NOT SURE	YES	YES	YES	NONE
reQuest II	YES	NOT SURE	NOT SURE	YES	NO	YES	NONE

FUNCTIONAL CAPABILITIES TABLE

	Security					Special Features	
	Password Security Levels	Password-Protected Tables	Password-Protected Fields	Audit Trails	Other	Applications Generator	Menu Generator
ADS	YES	YES	YES	YES	NONE	YES	YES
Fasport-dbm	66	NO	NO	YES	*153	NO	NO *7
Forms Plus	YES	YES	NO	NO	NONE	NO	NO
INFORMIX-SQL	YES	YES	YES	YES	NONE	YES *60	YES
Intelligent Query	NO	NO	NO	NO	NONE	N/A	N/A
Oracle (Oracle)	YES	YES	YES	YES	NONE	YES	YES
Oracle (Unisys)	YES	YES	YES	*151	NONE	NO	NO
Paradise	YES	YES	NO	NO	NONE	YES	YES
PDS-Adept	16	NO	NO	NO	NONE	YES	YES
PRESTO/REPORTER	YES	YES	YES	N/A	NONE	YES	YES
PROGRESS	YES	YES	YES	NO	NONE	YES	YES
R:BASE 5000	YES	YES	NO	NO	NONE	YES	YES
reQuest	YES	YES	YES	YES*152	*154	NO	YES
reQuest II	YES	YES	NO	YES	NONE	NO	YES

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

	Built-in Graphics	Programming Language	Special Features (cont'd) -Multi-User Capabilities- Record-Locking	RollBack/ Recovery Features	Networking Capabilities (distributed)
ADS	NO	YES	YES	YES	YES
Fasport-dbm	NO	YES	YES	NO	YES
Forms Plus	NO	NO	YES	NO	YES *156
INFORMIX-SQL	NO	YES	YES	YES	NO *157
Intelligent Query	N/A	N/A	N/A	N/A	N/A
Oracle (Oracle)	NO	YES	YES	YES	YES
Oracle (Unisys)	NO	YES	YES	YES	YES
Paradise	*155	YES	YES	NO	YES
PDS-Adept	NO	YES	YES	NO	YES
PRESTO/REPORTER	NO	NO	YES	N/A	YES
PROGRESS	NO	YES	YES	YES	YES
R:BASE 5000	NO	YES	YES	NO	YES
reQuest	NO	NO	YES	NO	YES
reQuest II	YES	YES	YES	NO	NO

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

	Ability to Store/Reference and Display			Special Features (cont'd) ------Portability------			
	Vector Graphics	Tagged Image File Format	Voice	UNIX	MS-DOS	MVS	VMS
ADS	NO	NO	YES	YES*159	YES*159	NO	NO
Fasport-dbm	NO	NO	NO	*160	NO *162	NO	NO
Forms Plus	NO	NO	NO	NO	NO	NO	NO
INFORMIX-SQL	NO	NO	NO	YES	YES	YES	YES
Intelligent Query	N/A	N/A	N/A	YES	YES	NO	YES
Oracle (Oracle)	*158	*158	NO *158	YES	YES	YES	YES
Oracle (Unisys)	NO	NO	NO	YES	YES	YES	YES
Paradise	NO	NO	NO	*161	YES	NO	NO
PDS-Adept	NO	NO	NO	YES	YES	NO	NO
PRESTO/REPORTER	NO	NO	NO	YES*159	YES*159	NO	NO
PROGRESS	NO	NO	NO	YES	YES	NO	YES
R:BASE 5000	NO	NO	NO	NO	*163	NO	NO
reQuest	NO	NO	NO	NO	NO	NO	NO
reQuest II	YES	YES	NO	NO	YES	NO	NO

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

	Special Features (cont'd) -Portability-			Cost of Telephone Support	Automatic On-Line Help	User Support		Other
	PRIMOS	Other OS	Other			Tutorial	Prompt Messages	
ADS	NO	NONE	NONE	*169	YES	YES	YES	NONE
Fasport-dbm	NO	NONE	NONE	*170	YES	YES	YES	*173
Forms Plus	NO	NONE	NONE	*171	YES	YES	YES	*174
INFORMIX-SQL	YES	OS/2	NONE	*169	YES	YES	YES	NONE
Intelligent Query	NO	NONE	NONE	*169	YES	YES	YES	NONE
Oracle (Oracle)	YES	*164	NONE	*172	YES	YES	YES	*175
Oracle (Unisys)	YES	*165	NONE	*169	YES	YES	YES	NONE
Paradise	NO	*166	*168	$299/YEAR	YES	YES	YES	*176
PDS-Adept	NO	NONE	NONE	$250/YEAR	YES	YES	YES	NONE
PRESTO/REPORTER	NO	NONE	NONE	*169	YES	YES	YES	NONE
PROGRESS	NO	*167	NONE	*169	YES	YES	YES	NONE
R:BASE 5000	NO	BTOS	NONE	$450/YEAR	YES	YES	YES	NONE
reQuest	NO	NONE	NONE	$495/YEAR	YES	YES	YES	NONE
reQuest II	NO	NONE	NONE	$695/YEAR	YES	YES	YES	NONE

FUNCTIONAL CAPABILITIES TABLE

Interfaces to Other Applications

	Graphics	Spreadsheet	Word Processor	Host Language Interface	Other
ADS	NO	YES	YES	YES	NONE
Fasport-dbm	NO	YES	YES	YES	*178
Forms Plus	YES	NO	YES	NO	*179
INFORMIX-SQL	NO	YES	YES	YES	NONE
Intelligent Query	NO	YES	YES	NO	NONE
Oracle (Oracle)	YES	YES	YES	YES	*180
Oracle (Unisys)	NO	NO	YES	YES	NONE
Paradise	NO	YES	YES	*177	NONE
PDS-Adept	NO	NO	YES	NO	NONE
PRESTO/REPORTER	NO	YES	YES	YES	NONE
PROGRESS	YES	YES	YES	YES	NONE
R:BASE 5000	NO	YES	NO	NO	NONE
reQuest	NO	YES	YES	NO	*181
reQuest II	NO	YES	YES	YES	NONE

* SEE NOTES STARTING ON PAGE B-45

FUNCTIONAL CAPABILITIES TABLE

	Required BTOS/CTOS Environment				
	------Hardware------		------Software------		
	Minimum Configuration	Costs	Minimum Configuration	Costs	
ADS	IWS	*171	*185	*171
Fasport-dbm	*182	*171	*186	*171
Forms Plus	512K RAM	*171	*187	*171
INFORMIX-SQL	B-25 NGEN	*171	*187	*171
Intelligent Query	*183	*171	*188	*171
Oracle (Oracle)	*184	*171	*189	*193
Oracle (Unisys)	B-28 4MB RAM	*171	BTOS II 2.0.4	*171
Paradise	NGEN 186 768K RAM	*171	CTOS/BTOS ISAM	*171
PDS-Adept	768K RAM	*171	ISAM	*171
PROGRESS	NGEN 186 1MB RAM	*171	*190	*194
PRESTO/REPORTER	NGEN 1MB RAM 7MB	*171	*186	*171
R:BASE 5000	IWS	*171	NONE	*171
reQuest	512K RAM 10MB	*171	*191	*194
reQuest II	NGEN 786K RAM 10MB	*171	*192	*171

* SEE NOTES STARTING ON PAGE B-45

NOTES TO FUNCTIONAL CAPABILITIES TABLES

KEY   EXPLANATION

*1   The following products may be used to enhance BTOS II
       Oracle RDBMS 1.1:
           BTOS II SQL*Plus 1.1
           BTOS II SQL*Calc 1.1
           BTOS II SQL*Report 1.1
           BTOS II SQL*Forms 1.1
           BTOS II PRO*C 1.1
           BTOS II PRO*Pascal 1.1
           BTOS II PRO*COBOL 1.1
           BTOS II PRO*Fortran 1.1

*2   Prints Laser Forms and Data

*3   Query/Report Writer

*4   Oracle requires 4MB RAM and 15MB disk space to operate the
       RDBMS and all optional tools. Memory requirement for the
       RDBMS is 1704K. SQL*Plus requires 400K and SQL*Forms
       requires 400K to 600K. For memory requirements of other
       Oracle products please contact Oracle Corporation

*5   Additional Memory Requirements for the following products:
           BTOS II SQL*Plus 1.1   1216.0K
           BTOS II SQL*Calc 1.1   1037.0K
           BTOS II SQL*Report 1.1   939.0K
           BTOS II SQL*Forms 1.1   1134.0K
           BTOS II PRO*C 1.1   329.0K
           BTOS II PRO*Pascal 1.1   329.0K
           BTOS II PRO*COBOL 1.1   333.5K
           BTOS II PRO*Fortran 1.1   330.5K
           ---An additional 250.0K is required for each Oracle
       application/user accessing the Oracle DBMS.

*6   Additional Disk Space Requirements for the following
       products:
           BTOS II SQL*Plus 1.1   685.0K
           BTOS II SQL*Calc 1.1   567.0K
           BTOS II SQL*Report 1.1   342.0K
           BTOS II SQL*Forms 1.1   1820.5K
           BTOS II PRO*C 1.1   658.5K
           BTOS II PRO*Pascal 1.1   705.0K
           BTOS II PRO*COBOL 1.1   735.5K
           BTOS II PRO*Fortran 1.1   739.5K

*7   Available on next release

*8   Oracle supports the 186 NGEN as a database client
       connected to a 286 or 386 NGEN database server

*9   ISAM, DAM, SAM

*10   ISAM, SAM, RSAM

KEY	EXPLANATION

*11   Ansi Standard SQL

*12   Sole Source, Variable length storage DB structure

*13   CT ISAM 10.1 or BTOS ISAM 8.0

*14   Proprietary, Variable length

*15   Runs on BTOS II, with/without GPS

*16   INFORMIX-TURBO (proprietary access) - not ported to CTOS/BTOS at this time

*17   Other-255; Text-64K

*18   Practical limits will vary depending upon system configuration however, it is limited by the maximum number of columns per table, maximum number of tables per database, size of the database, etc...

*19   Unlimited number of database descriptions

*20   Supports full page text fields

*21   Field size (digits in a number field):   105

Field size (significant digits in a number field):   40

*22   Unlimited number of databases

Comments 23-54: Note that answers varied from vendor to vendor between maximum data storage to maximum screen definition.

*23   smallint - 2 bytes; integer - 4 bytes

*24   NUMBER (versus INTEGER):
Column with space for 40 digits, exclusive of decimal point and sign. Numbers may be expressed in two ways: First with the numbers '0' to '9', the signs '+' and '-', and the decimal point ('.'); and second, in scientific notation, e.g., "1.85E3" for 1850. Maximum size is 105 digits. Maximum size after decimal point is 42 digits.

*25   Storage: $\pm$2,147,483,648

*26   4 BYTES storage +999,999,999

*27   50 Digits, 10 decimal places

*28   +/- 8.5E10

*29   Uses pascal real and real8

KEY	EXPLANATION
*30	smallfloat - 2 bytes; float - 4 bytes
*31	4 BYTES storage range of +9 x 10E37
*32	money ~= decimal
*33	For output only
*34	8 BYTES storage +$99,999,999,999,999,999
*35	Oracle's default date display is 7 characters long (e.g., 1-Jan-90). Dates may be formated in several ways, up to and including the full spelling of the month and day, and including the time in hours, minutes and seconds
*36	Valid date range from January 1, 4712 BC to December 31, 4712 AD. A date value includes a time of day as well as a date
*37	1/1/3276 AD/BC
*38	4 BYTES storage: many different formats available
*39	9 different formats
*40	4 BYTES storage: HH:MM:DD
*41	Day MMM:DD, YYYY HH:MM AM
*42	This can be implemented using other data types
*43	ReQuest does not have a specific boolean type. However, the user may define a coded or discreet field with 2 values (i.e. true, false)
*44	10E-128 - 10E126
*45	Excluding suffix
*46	Other field types: BYTE, COMP, COMP3
*47	18 Data Types Supported
*48	SERIAL (unique sequential number)
*49	RAW: Raw binary data, maximum size is 240 BYTES long. LONG RAW: Raw binary data; otherwise the same as LONG Row ID: A value that uniquely identifies a row in a table. It is returned by the pseudo-column ROWID and is processed by the functions CHARTOP JWID and ROWTOCHARID. Table columns may not be assigned this type

KEY	EXPLANATION
*50	COBOL specific field types
*51	BYTE, L-STRING
*52	Maximum characters per disk file or Index name: 7 Each database has 6 files on disk
*53	ReQuest also has Money fields, which will display with a $ and 2 decimal places
*54	Arrays and Telephone field, includes (,),-
*55	Using calculations
*56	With Programmer Logic
*57	To be available in PRESTO DESIGNER
*58	Masks for dollar data types on reports only
*59	2 decimal positions except numeric
*60	INFORMIX-4GL capable
*61	This is an optional attribute
*62	'E' and 'I' types
*63	Copies Field, unique destinations
*64	Numeric, date, range and time checks
*65	User defined highlighting
*66	Bold, Dollar, Left/Right Aligned, Hex
*67	Basic field attributes are limited but are defined without any programming. The powerful calculation language however lets users perform any of the above items very easily
*68	Cluster fields - allows users to group values within a category
*69	Allows designer to enter comment text for each field. The comment is displayed as the user enters data for the field. Also includes debugging aid to trace execution of procedural statements
*70	Directly interfaces with ASCII

KEY	EXPLANATION
*71	Word Processor merge files
*72	ADS, reQuest (CT-ISAM)
*73	WKS, WKI
*74	DBASE, LOTUS, ISAM
*75	ISAM, DBASE II, III and IV
*76	Multiplan
*77	One field per line, BASIC format, Comma separated, ASCII 0 separated
*78	W/P, Doc Designer Records Files
*79	Word Processor merge files from ISAM files
*80	Lotus 1-2-3
*81	DBASE, LOTUS, Word Processors
*82	WP List/Merge, ISAM
*83	List/Merge, BASIC
*84	Not >64 BYTES - Function of field sizes
*85	Primary index only
*86	Except LONG and LONG RAW column types
*87	Can construct from non-contiguous if necessary
*88	If within limit of record size
*89	At end of file
*90	If BYTE lengths match
*91	If ISAM reorg is performed
*92	Must be programmed in FCL
*93	Delete only from table
*94	Tables cannot be explicitly "opened". Please refer to comment *92

KEY   **EXPLANATION**

*95   The maximum number of tables which can be simultaneously "in use" is user configurable. The practical limit is dependent upon the system configuration, particularly the amount of available memory
--The DBS_INIT.ORA parameter, open_cursors, indicates the maximum number of cursors that each user is allowed to open. The default is 50 and the valid range is 10 to 255
--The DBS_INIT.ORA parameter, table_handles, indicates the number of simultaneous table used by all cursors. The default is 24 per process, with a minimum of 8

*96   A UNION operation may be performed using the reQuest Merge Utility

*97   AN INTERSECTION operation may be performed by executing a search where the key field of one relation is equal to the key field of another relation

*98   A DIFFERENCE operation may be performed by executing a search where the key field of one relation is not equal to the key field of another relation

*99   Key values can be programmed either unique or duplicates

*100   Built-in Programming Language; Interact with COBOL, Pascal, ADS and Other Data

*101   Browse records - Scroll records on any key

*102   INFORMIX-SQL has the ability to Add and Delete indexes without the need to redefine or reorganize the database, also indexing may be performed on the unique portion of a character field

*103   Paradise supports multiple windows to view several files/tables simultaneously

*104   Sort by clause

*105   The Oracle RDBMS often requires temporary tables to complete user transactions. The following SQL operations may require Oracle to create or use a temporary tables: CREATE INDEX, ORDER BY, DISTINCT, GROUP BY, UNION, INTERSECTION, MINUS, unindexed joins, and certain correlated subqueries. A temporary table is not created if the sorting operation can be done in memory, or if the optimizer finds some other way to perform the operation

*106   The ORDER BY clause may request ordering by key up to 240 characters, made up of any number of column names and expressions involving columns (so that it is possible to ORDER BY SAL+COMM, for example)

KEY	EXPLANATION
*107	Number of keys + 10 (=19)
*108	Equals maximum length of field
*109	Can be done indirectly
*110	Sorts only records selected to be printed
*111	Include/Exclude records from sort
*112	Can sort on a combination of fields from multiple tables
*113	Equals maximum number of fields
*114	Variety of searching can be programmed in FCL
*115	Partial word search
*116	Oracle provides several types of search parameters not already mentioned, including a SOUNDEX function which matches the sound of a word
*117	Paradise's 4GL language can be customized by defining synonyms for any calculation command
*118	DAM files only
*119	Order insignificant, no "first" in relational environment.
*120	If number is assigned to records
*121	The first value of the index order may be retrieved if the user enters the smallest possible value for the index and presses NEXT PAGE
*122	Use either primary or other keys
*123	Browse on secondary and non-key fields
*124	Super set of SQL '89 standard
*125	Query either through data entry or Report Writer
*126	Fill In Options
*127	Prompt (used to assist in developing queries or any RBASE command)
*128	List of functions contained in 4GL Library
*129	Named fields in formulas such as Multiplan

KEY   EXPLANATION

*130   Oracle provides a wide variety of mathematical functions, including Absolute Values, Greatest and Least comparison, Rounding, To-Number character to numeric value conversion, and Truncation

*131   Interactive, not menu driven

*132   Only available to licensed distributor

*133   Function key commands

*134   CTOS/BTOS record and playback (SUBMIT) facilities are available

*135   8 Full screen pages

*136   Equals maximum number of files (200)

*137   User definable help messages per field;
        User definable entry sequence;
        Box and Line Drawing; and
        Automatic Data Input Audit Trail

*138   Screen forms match preprinted forms

*139   File structure is easily created under the screen painter, without any programming. Users can interactively specify the color, size and position of each window

*140   Numeric fields

*141   Alphanumeric fields

*142   Available as separately priced item

*143   Columnar

*144   Any valid device

*145   Multiplan/Application Designer SYLK;
        Word Processing Records;
        Print selected portions of report from screen; and
        Chain together multiple reports

*146   Overlay laser form image

*147   Oracle permits direct data output to printer, screen, disk, tape, and to another system in a distributed processing environment

*148   Simple reports can be generated without any programming by simply selecting the fields to be displayed from a list

KEY	EXPLANATION

*149   Spooler, Automatic User Prompt

*150   Output to multiple devices at once (combination of
        devices)

*151   Oracle auditing is primarily a security feature. It does
        not record the values of columns updated, inserted or
        deleted from the database. However, it can be used to
        monitor user activity on an Oracle database. By default,
        there is no auditing activity

*152   Not automatic, but user can set up

*153   Menu Selection Protection

*154   User may define field level security for read and modify
        access

*155   Text mode only

*156   Bnet compatible in 1989, APT now

*157   Inter-Cluster networking is not supported in this release,
        however, Intra-Cluster is supported

*158   Can store and retrieve with customization, but not display

*159   Presently in beta test

*160   Report Writer available now, remainder available late 1989

*161   Available 4th Quarter 1989

*162   Available 1990

*163   Sort of - MS Read/Write. Not Built in

*164   WANG VS, DG, AOS VS, MACINTOSH, OS2, VM, DOS VSE, Xenix,
        Stratus VOS, Dynix, Banyan Vines, AIX, HP-US, MPE/XL,
        Utrix and UTS

*165   Oracle is written in the C programming language and runs
        on a wide range of mainframes, minicomputers and
        microcomputers, including the IBM 43xx and 30xx
        mainframes, System/88, RT PC, PC AT, and PC XT. The
        Oracle RDBMS also runs on Amdahl, DEC, Data General,
        Honeywell, Prime, Apollo, AT&T, Hewlett-Packard, Harris,
        Stratus, Unisys and other manufacturers' mainframes, and
        minicomputers, and on systems based on the Motorola 68000,
        Intel 808X and NAX 16000 families of microprocessors.

KEY   EXPLANATION

*165   (cont'd) In addition to running on a wide range of computer hardware, Oracle runs on over a dozen different operating systems, including IBM MVS and VM, DEC VMS and ULTRIX, DG AOS/VS and DG/UX, AT&T UNIX System V, and MS/DOS. Oracle is unique among relational database management systems in having demonstrated wide-ranging hardware compatibility and operating system independence*166OS/2, PC LAN

*167   DOS LANS, Xenix, Aux, Ultrix

*168   - User-defined menus can call any Paradise file, report or sub-menu as well as any external program, sub or run command file
- Applications and data can be automatically transferred between CTOS/BTOS and PC-DOS environments

*169   Included in Annual Maintenance

*170   First year free then $90/YEAR

*171   See Standard Terminal Contract

*172   Negotiable - varying levels of support available

*173   On-site and scheduled training

*174   Auto Demo

*175   Oracle also provides varying levels of onsite support and extensive user training

*176   Paradise is designed for developers and for end-users. Necessary training is minimal

*177   Any executable program can be started from within Paradise calculations, but you cannot return to the starting point in the calculation

*178   Document Designer, Solution Designer

*179   reQuest, ADS, PDS-Adept, Perfect Form

*180   Oracle also interfaces with a wide variety of 3rd party packages including other databases, inventory management, law, manufacturing, etc. A VAR (Value Added Reseller) catalog is available upon request. Send requests to Oracle Corporation

*181   Can access files programmatically through ISAM calls

NOTES TO FUNCTIONAL CAPABILITIES TABLES (cont'd)

KEY	EXPLANATION
*182	1 Workstation, 512K, 10 MB Disk - no special hardware required
*183	512 KB/Workstation - 768 KB/Master-Hard Disk
*184	286/386, 4 MB RAM, 40 MB HD
*185	CTOS 9.8 or higher, BTOS 5.0 or higher, ISAM 9.0 or higher (Unisys ISAM 5.0 or higher) for non-LFS support, ISAM 10.1 or higher (Unisys ISAM 7.0 or higher) for LFS support. CT Forms package 7.0 (or higher) or Unisys Forms Designer 5.0 (or higher) or CSI Forms Designer 1.0 (or higher)
*186	CTOS 9.1, CTOS/VM, BTOS 5.0, BTOSII
*187	CTOS 9.8, CTOS/VM, BTOS 8.0, BTOSII
*188	ISAM BTOS 6.2 (or CTOS Equivalent) or higher
	BTOS 7.0 (or CTOS Equivalent) or higher
*189	CTOS VM 2.3, Standard SW 11.3
*190	CTOS 9.8 (BTOS 5.0); ISAM 10.1
*191	BTOS 4.0 or higher, ISAM 4.0 or higher
*192	CTOS 9.8 or higher
*193	Oracle software from Oracle Corporation is not included in the Coast Guard's Standard Workstation Contract. Software availability and pricing from Oracle may differ from that proposed by third party vendors
*194	Included with Standard Coast Guard Software Bundle

(THIS PAGE LEFT INTENTIONALLY BLANK)

APPENDIX C
EVALUATOR DEMOGRAPHICS

Evaluator 1:   Age: 22   Sex: F   Education: BS, Computer Science

Background: Recent graduate.   Little experience other than that
            acquired during education.   No DBMS experience.

Evaluator 2:   Age: 31   Sex: M   Education: BA, Liberal Arts

Background: 7 years technical support to a computer hardware
            manufacturer including board level testing, repair,
            and documentation.   Minimal programming and no DBMS
            experience.

Evaluator 3:   Age: 30   Sex: F   Education: BS, Management

Background: 2 years user support DBMS systems, including data
            entry and training.   4 years data analysis using data
            from manual systems.   No programming experience.

Supervisor 1:   Age: 36   Sex: M   Education: BEC, Economics
                GDipEd, Education.

Background: 11 years experience in all phases of MIS work, from
            programming to management, and across a wide variety
            of hardware, from mainframes to micros.

Supervisor 2:   Age: 56   Sex: M   Education: PhD, Physics

Background: 15 years experience in programming, software design,
            and system analysis.   5 years of that time was
            supervising the total software life-cycle process for
            application development under BTOS.

(THIS PAGE LEFT INTENTIONALLY BLANK)

APPENDIX D
DATABASE EVALUATION PHASE II REPORT

This Appendix contains a report written by Electronics
Engineering Center (EECEN), Wildwood, NJ. EECEN evaluated the
ease and effectiveness of porting a portion of a Mission Critical
Software application, PROPERTY, to three database products;
PROGRESS, Oracle and INFORMIX-SQL. This report was completed
January 25, 1989.

BACKGROUND:

This evaluation provides an analysis of the application
programming performance of three database products; PROGRESS,
Oracle and INFORMIX-SQL. The evaluation was performed on a
286 NGEN, with math coprocessor and 4MB of random access memory,
operating under BTOS II and/or CTOS VM version 2.2.

EECEN has written several applications using the Application
Development System (ADS) language. PROPERTY, a simple
application, was used as the test vehicle for this evaluation.
The main function of PROPERTY, the entering of Allowance and
Detail records was ported to each of the products. In addition,
an ISAM database, from a Seventeenth Coast Guard District unit,
was transferred to the new DBMS file system.

Several factors were evaluated for each product:

    Building an application
    Human Interface
    System Requirements
    Documentation
    Support
    Product maturity in the CTOS/BTOS environment

EXECUTIVE SUMMARY:

PROGRESS should be the DBMS of choice for the majority of future
Coast Guard development efforts. It is the ONLY DBMS of the
three which can execute under BTOS II version 1.1. The software
tested is distributed as part of the standard bundle. It
provides a robust development environment that meets the needs of
developing small end-user and large corporate database
applications. The data is stored in relational tables which
provide full ad hoc query capability. Its speed in accessing the
data and formatting reports is an order of magnitude faster than
an equivalent ADS application. SQL and network data/program
transfers are expected to be a part of PROGRESS version 5.0.
This version will be released late in January 1989. The cost of
installing the minimum hardware and software for 100 sites
(master plus three terminals per site) is approximately 980
thousand dollars.

Oracle is presently in the beta test phases on the Standard
Workstation. Not all of the product has been fully ported as of
this writing. It requires CTOS VM version 2.2 or later to run on
the Standard Workstation. Oracle is a relational system
complying with the ANSI SQL standard. We recommend that Oracle
be considered only when it is necessary to maintain compatibility
with existing applications running in a mainframe environment.
Even under those circumstances, selection and development should
be contingent upon two critical events: (1) successful operation
under BTOS II, and (2) the arrival of network capability to that
DBMS. Oracle requires expensive hardware platforms, and site

licenses. The cost of installing the minimum hardware and software for 100 sites is approximately 2.5 million dollars.

INFORMIX is also a beta test product. The product normally consists of three distinct entities, INFORMIX-SQL, INFORMIX-4GL, and INFORMIX-ESQL/C. At this time, only the SQL product had been ported to the Standard Workstation. Like Oracle, it requires CTOS VM version 2.2 or later to execute. INFORMIX should not be considered for Coast Guard application development until such time that the port to BTOS II is complete. The cost of installing the minimum hardware and software for 100 sites is approximately 2.0 million dollars.

DBMS COMPARISON:

CRITERIA	INFORMIX-SQL	PROGRESS	Oracle
Windowing Forms	No	Yes	No
Site License Cost	810K	Bundled	810K
minimum System			
CPU	286	286	286
RAM	1MB	1MB	4MB
Disk space	4MB	6MB	13MB
Recommended System			
CPU	286	286	386
RAM	1MB	1MB	8MB
Disk space	40MB	40MB	80MB
Compatible with STD			
BTOS II version 1.1	NO	YES	NO
Relative Speed			
ADD	1 #1	5	7
DELETE	1	5	8
QUERY/REPORT	1	10	78
SQL based file system	yes	no #2	yes
Cluster file sharing	yes	yes	yes
Network file sharing	no	no #2	no

NOTE: #1 (1) indicates the slowest relative speed.
#2 SQL and networking capability scheduled for delivery in late January 1989.

PACKAGE NAME: PROGRESS

PLUSES:

Performance seemed very good (see PERFORMANCE RESULTS).
Documentation is good. It is a part of the Coast Guard Standard
Workstation bundled software. The programming language seems
very flexible and powerful.

MINUSES:

It is a new programming language to learn, and requires time to
get used to the flow of control, formatting schemes, display
techniques, etc. FAST TRACK, an application building tool, is
not available at this time.

BUILDING AN APPLICATION:

The central point of the PROGRESS development environment is the
Data Dictionary. It is a menu driven dictionary which actively
enforces the schema (i.e., unique keys) and validation rules
which you define for the database. You can also perform
additional validation checks during data input. Once the
relational files are defined, PROGRESS development revolves
around its built-in editor. You can recall or save developed
procedures and execute them from within the editor. Procedures
can be developed in other editors and recalled while in PROGRESS.
The programming language took a while to get used to. It seemed
very procedural to me. When designing screen forms, the defaults
are very rudimentary. Tailoring the screen requires specifying
row-column locations and numbers of lines to skip, etc. The
default way in which the screen as handled is to open up
individual "frames" for each procedural block of code. This can
be altered by specifying re-use of the same frame. The editing
capabilities are very flexible, allowing individual keystrokes to
be read and interpreted if you want to. PROGRESS gives the
programmer use of the entire screen with the exception of the
bottom two lines which are used for messages. Writing reports is
similar to designing screens except now you are laying out the
page format. Here again the defaults are fairly skimpy. The
availability of the FAST TRACK report/query generator may have
helped in the generation of simple reports although it wasn't
difficult, just tedious. All my testing was done using Single-
User PROGRESS. The documentation discussed record locking and
contention fairly well so it appears that they give multi-user
access a fair amount of consideration. I was able to easily use
the ISAM Quoter utility, which PROGRESS provides to take the
existing data files which contained approximately 6,000 detail
and 1,600 allowance records, and load them into the test
application. Finally, application security is advertised as
available to provide password protection although I was not able
to test it.

INTERFACE:

The Data Dictionary is menu driven and easy to use. I had a
problem modifying the primary key. Essentially, each file has to
have at least one key, so you cannot modify the primary key
directly. What you have to do is create a new key (the
modification), make it the primary key, and then you can delete
the old primary key. The on-line help is also menu driven and
was useful for syntax checking during use of the editor although
you get a strange message when the user presses the "HELP" key
during a programmer-defined procedure. I'm sure there's a
workaround, but I didn't figure it out. Note that this does not
cause a crash, it simply terminates the procedure. In fact, I
was not able to "crash" PROGRESS at any time during my testing.
I found that the system error messages were fairly informative.
Menu interface to the user was basically building a screen form
which called other procedures. The PROGRESS editor is good in
some aspects and not so good in others. I liked the way that it
automatically picked up indentation from the previous line, would
tab to the number of spaces which you indented before, and would
put the cursor at the point of a syntax error. I hated its Cut
and Paste mode because it required that you explicitly create
temporary files and I thought it put in extra CR/LFs when I
didn't want them.

SYSTEM REQUIREMENTS:

The documentation states that at least 768K is required but
recommends at least a 1 megabyte. While running a report, the
partition status showed that the single-user version was using
780K. The DLC directory took approximately 12,000 sectors of
disk space and the directory in which I built the sample
application took approximately 3,500 sectors for the property
database itself.

DOCUMENTATION:

I evaluate the documentation as very good. I felt that it
covered most of the topics I was interested in as an application
developer in at least some degree. It was sometimes difficult to
find specific topics since it was split between the Tutorial, the
Programming Handbook, and the Reference Manual. Since the
product was loaded during the overall BTOS load, I was not able
to see how difficult or easy it is to load it independently.

SUPPORT:

I called the company to ask about using the product in a
networked environment and asked for someone to talk to about
using BTOS PROGRESS and was passed to a phone recorder (maybe at
lunch?). I left my phone number to see how fast they get back to
me. They called back the following afternoon and were very
helpful and informative.

OVERALL:

I liked PROGRESS. I thought the product did what it was advertised to do and it did it well. From a developer's standpoint, I would be very willing to use this product.

PERFORMANCE RESULTS:

Action w/indexes built
Insert/load records   36.0 minutes for 6213 records
Delete records   10.0 minutes for 6213 records
Ad hoc query   2.5 minutes for 6213 records
Write report to disk   20.0 minutes for 6213 records

EECEN - January 1989

PACKAGE NAME: INFORMIX-SQL

PLUSES:

Full SQL compatibility. Easy to code.

MINUSES:

Only a BETA-test version. INFORMIX-4GL and INFORMIX-ESQL/C have
not been ported yet. Encountered frequent system tie-ups while
using the product which required rebooting the system.

BUILDING AN APPLICATION:

The data dictionary can be loaded either through a menu or
directly by entering SQL (RDSQL-INFORMIX's SQL language)
statements, in fact any of the functions provided by the menu
interface can be driven directly by RDSQL statements. The next
recommended task after defining the database tables is to develop
screen forms in order to enter data. The documentation
recommends using the menu to generate a default form and then
modifying that as needed. The form which is generated is fairly
skimpy but easy to modify. Scrollable forms did not seem to be
easy to generate and, in fact, the documentation did not give any
examples. I looked at an INFORMIX-4GL manual which we had for a
PC version; and in there, they showed how to generate scrollable
forms. In basic INFORMIX, I did not see a lot of flexibility
regarding data input options with regard to monitoring individual
keystrokes or use of function keys (although I didn't
exhaustively try to find a way to do this). The screens also
waste at least three lines on every form because the Executive
version and Path descriptors from the Executive are left on the
INFORMIX screen. Another comment about the screen forms is the
use of the "[' and ']" symbols to delimit fields. They seemed to
make the screen crowded and I did not see a way to change them to
another symbol if a programmer wanted to. Simple query requests
can he driven from the screen interface. Just put the
appropriate values into the fields you are interested in looking
at and INFORMIX tells you how many records meet that criteria.
Then you can scroll through the data one record at a time (back
and forth). More complex queries can be generated via RDSQL.
The menu also has a Report generator. It is similar to the
screen generator and is fairly easy to modify. There is also a
menu generator which calls the forms or reports which you
develop. I didn't see much if any mention of security or multi-
user concerns. I only tested the product in a single-user
environment. As far as loading the database with existing data,
INFORMIX supplies a database load (dbload) utility. This
basically allows you to create a command file which specifies how
the ASCII file is laid out and then load into the appropriate
columns. The only problem I experienced in using this utility
was that it exited to the Debugger when I tried to commit
records. I got around this by specifying a number to commit
greater than the number of records I was loading, and it worked
for the simple file I was creating.

INTERFACE:

This is a Lotus 1-2-3-type menu-driven package. I felt it was
easy to work with. I liked having the system Editor available
for use. The only thing I didn't like was the time it took to go
between the editor and ISQL. The other problem I had with
INFORMIX was frequent crashes. This could be due to the fact
that this is a Beta-test product or it could have been due to my
environment (CTOS/VM). What frequently happened was in modifying
the reports or forms, I would go to compile and receive an error
message. Then when I fixed it and went back into ISQL, ISQL
would tie up and I would have to reboot in order for ISQL to be
able to work again. Sometimes I would compile a report one time
and it would tie up ISQL, then I would go back and it would work
the next? (see SUPPORT)

SYSTEM REQUIREMENTS:

The documentation states that the approximate memory requirements
for the software requires INFIX 499K and ISQL 551K. The
partition status showed that the INFIX was using 498K and ISQL at
510K. I was not able to load INFORMIX on BTOS because during the
initialization I received an "invalid request code" error
message. INFIX is basically a server which resides in CTOS to
make the operating system's file handler behave like UNIX. From
our limited tests, it appeared as if there was a lot of disk
activity on the system volume when carrying out ISQL processing.

DOCUMENTATION:

I felt that the documentation is well organized but it seems to
be written for INFORMIX on any machine and, therefore, does not
address subjects in a lot of depth because that would most likely
lead to discussing specific machine differences.

SUPPORT:

I contacted the Technical Representative at Datafocus and told
him that I was experiencing problems and sent them a copy of one
of the reports that gave me a problem. I told him that I was
unsure of the CTOS environment and requested a release for BTOS.
He seemed very helpful and stated that new Beta version should be
out in mid-January which hopefully will be able to load onto
BTOS.   Mr. Jay Miller (the product coordinator for Datafocus)
stopped by in December to describe the plans for INFORMIX. He
said the next major development would be the INFORMIX-4GL and
that we would get a Beta copy as soon as it was ready. I feel
that Datafocus is very willing to work with the Coast Guard to
improve their product and provide as much support as possible.

OVERALL:

I encountered too many system crashes while using the product in
order for me to feel comfortable with using this software in a
production mode for the near future.   INFORMIX is not fully
debugged in the CTOS/BTOS environment.

PERFORMANCE RESULTS:

Action w/indexes built
Insert/load records   17 minutes for 1788 records
Delete records   16 minutes for 2038 records
Ad hoc query   7 minutes for 1788 records
Write report to disk   17 minutes for 1788 records

                                          EECEN - January 1989

PACKAGE NAME: Oracle

PLUSES:

Performance was very good. I had no difficulty in learning the
programming environment. The screen painter was very nice as it
allowed you to build forms very easily. Overall, I considered
the documentation to be very good.

MINUSES:

Oracle requires a minimum of 4MB of RAM and will only operate
under CTOS VM 2.2. Not all of the Oracle products have been
ported over into the CTOS/BTOS area, and a major one is SQL*Menu,
which allows you to tie your application together through the use
of menus.

BUILDING AN APPLICATION:

To build an application in Oracle, you needed to use SQL*Plus to
build your data dictionary, and the screen painter to design the
data entry screen. I found SQL*Plus very easy to use and very
powerful. Although there are no data dictionary reports or
displays to the screen, you could build your own queries to
perform these functions. You could also build indexes on the
fly, insert new columns, or delete columns from tables in
SQL*Plus even if you had data stored in the database. The main
limitation I saw was that while performing queries, you could
only query using column names and not indexes. Thus, if you
built a composite index, you could not refer to it in a query,
but would have to refer to each column name individually.

The screen painter was easy to use to build simple data entry
forms. Oracle uses "triggers" in their forms to initiate action
such as data validation. I was able to build some simple
triggers with no problem. However, as I tried to build some more
complicated triggers (e.g., to provide help from a table), I had
a difficult time in getting them to work. Part of the problem
was that this was a beta product and there were still some
problems to be worked out. Although they did provide some
examples of using triggers, I would have liked to have seen some
more. I had a difficult time in trying to bring up a prefixed
help form.

I used the SQL*Loader function to load some initial data from an
ASCII file. This utility worked very well and was very easy to
use. It simply involved building a small control file and an
initial data set and running it. The performance was very good
(see PERFORMANCE RESULTS).

SQL*Report is also available to generate reports from your
database. It allows you to use SQL queries to retrieve data and
format commands to generate the report. I was able to build
reports with relative ease. However, in trying to build a more

complicated report, there appeared to be some limitations in using SQL*Report. For example, the PPA report in the UFS-Property module could be built but would have been very inefficient unless another table was added to the database.

The main drawback in building an application was that there was no 4GL. Oracle is a 4GL environment but does not have a programming language of its own. The use of triggers in forms allows you to perform many functions a language could provide, but is not as powerful. However, you could write programs in "C" and embed SQL statements in the code to perform special functions. Not being an skilled "C" programmer, I was unable to test this module.

INTERFACE:

Each product supported by Oracle (e.g., SQL*Forms, SQL*Plus) is invoked from the executive. Oracle would have to be warm-started first (initialized if you do not have an initial database) and you could work everything from the executive. You could perform executive functions while Oracle was running, but not from within the applications themselves. Help was available in most areas when you needed it and I thought the SQL*Forms interface was very good.

SYSTEM REQUIREMENTS:

Oracle requires a minimum of 4MB of RAM to run. Some utilities require less; however, I needed 4MB to run the SQL*Forms module. The Oracle-required files also take up approximately 15MB of disk space. Because of the RAM requirement, a 286 or 386 processor is needed to run Oracle. I would recommend running Oracle on a B38 system (8MB RAM capacity) as you could not install many services in RAM once Oracle is running. Oracle is only supported under CTOS VM 2.2 at the present time.

DOCUMENTATION:

Overall, the documentation is excellent. I was able to find my way through the products easily. There was also a Forms tutorial which proved to be very useful and easy to use. Each product had its own reference manual, and some products had a users guide and a reference manual. Therefore, if you knew what you were doing, you could simply go back to the reference manual. If you wanted some more detailed information, you could look in the users guide.

SUPPORT:

There was one point of contact for support and she provided me with excellent support. She was on the road quite a bit so I was unable to contact her directly most of the time, but I could usually leave a message and she would call back in a timely fashion.

OVERALL:

I enjoyed working with Oracle and found it relatively easy to use. Although I was not able to duplicate some items from the Property system, I believe that given some time, these could be worked out. The performance of Oracle was very good. Once fully ported to the CTOS/BTOS environment, Oracle will be a very capable DBMS. However, its demanding system requirements and high licensing costs must be considered before selecting Oracle for a large system development project.

PERFORMANCE RESULTS:

Action	w/o indexes built
Insert/Load records	22.0 minutes for 6209 records
	2.5 minutes for 1788 records
Delete records	6.0 minutes for 6209 records
	1 m 25 s for 1788 records
Ad hoc query	20.0 seconds for 6209 records

Action	w/ indexes built
Insert/Load records	26.5 minutes for 6209 records
	4.0 minutes for 1788 records
Delete records	not tested
Ad hoc query	2 m 43 s for 1788 records

During the loading of records, the load time was not just a function of the number of records being loaded, but also a function of the amount of data contained in the table. The Property table (6209 records) had over twice as much information to store as the PropAllow table had (1788 records). Oracle would commit records when its cache buffer was full. It was committing every 9 records for the Property table, and every 24 records for the PropAllow table.

The ad hoc query I performed was a simple select statement which summed up the quantity on hand for each of the property records. All tests were done on a 286 processor.

EECEN - January 1989

APPENDIX E
VENDOR RESPONSES TO REPORT

This Appendix contains the unedited responses from vendors involved in the database evaluation.

(THIS PAGE LEFT INTENTIONALLY BLANK)

**Convergent
Solutions,
Inc.**
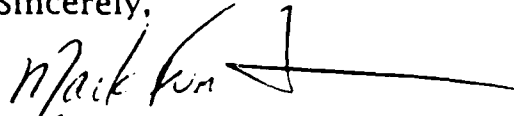
January 15, 1990

Lt. Jon Allen
Informations System Center
Systems Management Division
7323 Telegraph Road
Alexandria, VA 22310–3999

Dear Lt. Allen:

Following our review of the Bake Off results, Convergent
Solutions would like to make these comments part of the record.
As you will see, we feel the bake off did not measure many
things which we believe should have been reviewed. If you have
any quesitons, please contact me.

Sincerely,

Mark R. Funt
Vice President

Comments on the Coast Guard Bakeoff
Convergent Solutions, Inc

The Coast Guard Bakeoff produced an extensive volume of data. Unfortunately, the data were gathered in an inquiry which, a priori, had quite a restricted scope. Further, some of the methodology used in this inquiry is open to question.

The inquiry essentially used only two criteria to evaluate several products. Quantitative analysis purported to show the relative performance of the products studied. A more "subjective" study evaluated product effectiveness when used by "inexperienced end-user[s]" (p 1-1). A more valuable basis for comparison, the ability for professional software developers to produce attractive, fully functional database applications, was omitted from the study.

CSI's comments on the bakeoff can be divided into three catagories. Product effectiveness, Application Quality, and Performance. Having worked with Coast Guard developers for 7 years, and having seen our software installed on over 17,000 clusters world wide, we feel that the bakeoff was too limited in scope in looking at the total life cycle of software development. Detailed comments are as follows:

I.   Product Effectiveness

Nowhere in any of the criteria is the quality of the application which can be produced considered, or the "human interface" provided to the end-user of the application. Only the human interface for the programmer is considered.

In fact, there is no consideration of the functionality of the final application whatsoever. It's as if a car manufacturer judged the speed of the auto assembly line, or the happiness of the people on the line, but did not measure subsequent driver satisfaction. The evaluation omitted some of the most important criteria for judging an application.

II.   Application Quality and Functionality

The issue of application quality was addressed only by the "Functional Capabilities Tables". However, no attempt was made to summarize these tables in a way that would be helpful to potential developers and/or users of the developed applications. Consequently, the Bakeoff results cannot provide answers to the critical questions that are posed by people attempting to select an application development system.

First and foremost, will the application be able to do all that it is required to do? For example, ADS applications have been written which support both *voice and image processing.* Further, *text can be seamlessly integrated* into an ADS data base, allowing users the ability to maintain free–format comments in conjunction with their fixed–format relational tables. If use of these non–standard data types is required, as it may increasingly be in office automation applications, ADS will do the job. ADS has also been specifically designed for the CTOS/BTOS environments, allowing it to take advantage of OS specific options such as communications with OS loadable requests.

Further, the ergonomics of the application to be produced are nowhere considered. Consider the case in which two implementations of the same application supply the same functionality, but one is much easier for end–users to use, and to learn. Surely, the implementation which encourages end–users should be preferred. Yet, the Bakeoff includes no criteria on which potential buyers can determine which product will produce more user–friendly applications. And, contrary to your performance findings, it just might be the case that the products originally developed in a CTOS environment allow developers to build the "best" applications (in terms of both functionality and user interface) for use in that environment.

III. Performance Testing

The performance testing contained many unnecessary statistics. The performance timings appear to measure the data base management system –– the physical access method used to store and retrieve data, rather than the development systems which were the ostensible objects of study. Giving performance statistics for each access method, instead of or in addition to each product, would have made it easier for readers to see the important finding of the performance timings –– that CT–ISAM based systems have slower access and update times than systems using other proprietary access methods.

So, the performance test results contain too many statistics. Conversely, the results lack the statistics which could have answered the important question: how do the various access methods perform in the environment in which they will almost certainly be used, that is, in a multi–user environment? Is a test of data base management products in a multi–user environment really not "an accomplishable task" (p. 4–3)? This is contrary to what our experience at Convergent Solutions, and readings in the field of software quality assurance and performance testing suggest. If only one series of tests was "accomplishable", why use a single–user scenario when, clearly, the products are typically used in multi–user situations?

So, even the one conclusion that can be reached by summarizing the normalized timings (non–native access methods are faster) is not of para-mount relevance to a potential buyer trying to evaluate performance in a typical, multi–user environment.

IV.   Supplementary Information

We would like to take this opportunity to clear up an omission. Informix on BTOS/CTOS is, in fact, supplied by Convergent Solutions, the same company which supplies ADS.   DataFocus, sited as the supplier of Informix, is a division of Convergent Solutions. Technical support for Informix, ADS, and CSI's Reporter was all suppliced by the CSI hotline Support group located in Laurence Harbor, New Jersey.

Software Research, Inc.

January 11, 1990

Mr. J. J. Thrower
Executive Directory, ISC
United States Coast Guard
7323 Telegraph Road
Alexandria, VA   22310-3999

Dear Mr Thrower:

Thank you for including Fasport-dbm in the Coast Guard Database
Bakeoff. We found the results very interesting. We were
especially interested in the fact that Fasport-dbm performance
showed up as excellent among ISAM-based database products. This
result confirms an approach that we have long taken in marketing
Fasport-dbm as a tool for use in connection with data bases and
files created by COBOL and other ISAM based systems, where people
require an easy and fast means of making reports and modifying
data bases.

The Database Bakeoff was performed using Fasport-dbm release 5.1.
You need to be aware of a number of significant changes that have
been made to Fasport-dbm in release 5.2, announced in November,
1989.

   * An easy to use Query module has been added for extremely
     rapid creation of queries and reports. This module
     complements the powerful report writer already a part of
     the package.

   * Text handling capability has been added that permits
     databases to include unlimited and free-form text.

   * A new development menu and development utilities have been
     added to aid in application development.

   * A forms driven menu editor has been added for quick
     creation of application menus.

   * An index is included as a part of the release 5.2 reference
     manual.
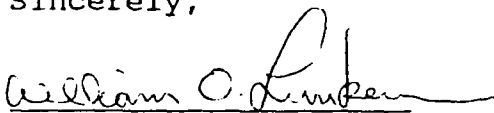
Among the strengths of Fasport-dbm that you should be aware are:

   * The ability to directly access existing ASCII and ISAM
     files, without having to "import" them or to duplicate them
     on disk, and to interface with most popular data types.

BTOS DATABASE EVALUATION   Page E-7

* Easy creation of simple or complex data entry forms.

* Ease of finding a desired record using any key within an ISAM file.

* High performance report writing.

* A forms-driven approach in design of simple applications, with an optional built-in language extension to handle complex jobs.

* A menu system (available as a stand-alone module) for driving applications made up of virtually any types of run files. The menu system includes encrypted password security.

* An excellent price/performance ratio.

We stand ready to assist any Coast Guard unit in evaluating the applicability of Fasport-dbm to their specific requirements.

Sincerely,

William O. Limkemannn
President

FORESITE

4 Convergent
Applications
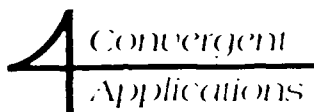
775 Upland Road
Redwood City, CA 94062
415 363 0688
Telex 650 280 0299

January 22, 1990

J.J. Thrower
Executive Director, ISC
United States Coast Guard
7323 Telegraph Road
Alexandria, VA 22310-3999

Dear Mr. Thrower,

Foresite would like to thank the Coast Guard for giving us the opportunity to participate in the Data Base Bakeoff. We'd also like to thank Richard Kaiser and Bernadette Yu from FYI for their assistance and representation of Foresite during the analysis.

Forms Plus is not a data base product in the generic sense. Forms Plus deals with forms. Any kind of form, be it a six-part requisition or a mailing label. When you need to print information in specific locations, on any size paper, this is the best tool in the class for the job.

Over the past five years, we have observed that forms are the ultimate data entry vehicle. The information that goes in these forms is already in a data base or should be. With that in mind, we provide a flexible and easy-to-use interface to any ISAM or WP records file. Forms Plus can convert data between these two formats (ISAM to WP or WP to ISAM) as well as supporting DEF formats. Many of our customers (including the Coast Guard) have told us that they use forms to define data bases. And to do this they use Forms Plus. While other packages have superior reporting capabilities, none of them deals with the issues of pre-printed forms, which continue to represent 1/3 of the output of today's office.

The reviewer had difficulties with the sample application we provide called 'Tracker'. This was a tutorial developed specifically for the Coast Guard at the direction of Headquarters TIS group. Tracker has been modified and is used extensively throughout the Coast Guard for tracking everything from legal cases to the Admiral's correspondence files. We take to heart the suggestions for improvements to the documentation. I promise the next manual update will include an index!

Thank you again for allowing us to participate and congratulations for producing a superior report on a difficult subject.

Sincerely,

Karen Toland

Karen Toland
President

kt/fp

cc: Richard Kaiser and Bernadette Yu, FYI

(THIS PAGE LEFT INTENTIONALLY BLANK)

APPENDIX

INTELLIGENT QUERY

Programmed Intelligence Corporation would like to address the three areas perceived as "weak points" of the U.S. Coast Guard Investigation as follows:

1.)   READ ONLY PROGRAM

Intelligent Query is designed as a "read only" product. Our experience indicates that while traditional database management software and 4CL's allow for creating/updating application data, they fall short at providing end user tools for analyzing and reporting on application data.   IQ gives both the system administrator and the end user an extremely powerful product that cannot possibly update or corrupt application data.

2.)   COMPLICATED FILE STRUCTURE SETUP

Due to the variety of operating systems, databases, file structures, field types and relationships supported by IQ, many variables must be considered in order to optimize the definition of files to IQ. Defining file structures to IQ is only done once per application, and is best accomplished by the author of the application. IQ is designed to shield the end user from the set up/Definition process.

3.) EXITING FROM SOME SCREENS ALLOWS WORK TO BE LOST WITHOUT WARNING

This problem has been corrected in the current version of Intelligent Query.

INTELLIGENT QUERY
"QUERY/REPORT WRITER TOOL"
PRODUCT BRIEF

Intelligent Query is a powerful Ad Hoc Query/Report Writer information retrieval and analysis tool. Based on artificial intelligence concepts IQ utilizes reasoning based menu pop-ups and an intuitive visual interface, so even novices can produce complex reports and graphs, regardless of the file relationships or the indexing method being used. The over 50,000 copies of IQ installed world wide demonstrates the need and acceptance of this product.

IQ is currently available on a wide range of hardware/Software platforms such a Unix/System-V, Berkley 4.2, VAX/VMS, BTOS/CTOS, DOS and others. IQ can interface to such file structures as DBASE, INFORMIX, ORACLE, UNIFY/ACCELL, CIsam, COBOL, BTRIEVE and more. We have just completed a Generic SQL interface, which will make interfacing I.Q. to any ANSI compliant RDBMS much easier. It is also our strong belief that SQL is not an end user tool.

IQ contains system modules to allow the following operations:

- Custom Report Writer
- English Language Ad-Hoc Query System
- Business Graphics Presentation Module
- Ad-Hoc File transfer to Lotus 123, Multiplan, DIF, and to an ASCII file for integration with word processors and other software packages

IQ can merge information from an unlimited number of files or tables and select, sort, and perform calculations on any fields in those files. It can move data directly into mail merge or Lotus or Multiplan spreadsheets instantly; transporting only the information you want, sorted the way you want it, with no complex import or export procedures. It can create properly scaled bar graphs in seconds. And it produces simple columnar reports with a few keystrokes...sophisticated reports in minutes instead of hours.

A command language extends the flexibility to that of a programming language providing conditional (If then, else), move, parameter passing, and other capabilities. This provides tremendous power for more sophisticated end users and programmers.

IQ contains extremely powerful data relationship capabilities. Because IQ supports many databases and languages even separately developed data structures can be related with IQ.

IQ is written in the C Language, which adds a great deal of portability and compatibility in regards to hardware/operating system and Data structure.

January 30, 1990

United States Coast Guard
Information Systems Center
7323 Telegraph Road
Alexandria, Virginia 22310

ATTN: Lt. Allen

Dear Lt. Allen,

Oracle Corporation would like to take this opportunity to voice its appreciation to the U.S. Coast Guard for including the ORACLE RDBMS in its "BAKE OFF" Evaluation.

Oracle has provided along with this response evaluations of the Oracle RDBMS and other data base competitors in the LAN, mini and mainframe. We have provided these surveys to counter the subjective evaluation and the weights that were given to certain functions within the Bake Off. ORACLE feels that not all requirements are equal and that the subjective analysis was skewed due to the manner in which they were weighed.

The ORACLE RDBMS is an extremely full featured, robust Relational Data Base Management System that is considered the most powerful RDBMS on the market today. Due to the fact that it is so feature rich, an indepth offering of manuals is provided and novice users are encouraged to at least attend introductory training in ORACLE so as to be able to fully utilize the benefits of this high performance data manager.

Lt. Allen
Page Two

Through Oracle's reliability, performance, support, compatibility with standards, portability and capability, we are and look forward to supporting the U.S. Coast Guard's information technology needs.

Sincerely,

John A. Marrah
Director of National Accounts

JMM/tmr

U.S. COAST GUARD
INFORMATION SYSTEMS CENTER
DATABASE BAKEOFF COMMENTS

Oracle appreciates the opportunity to submit the following comments and clarifications regarding ISC's Database Bakeoff Report:

Narrative Evaluation, Section 3-A

Documentation/Tutorial:

Oracle offers an extensive library of documentation to support all ORACLE software products. Each manual is prefaced with an explanation of the product and its intended audience. Manuals are primarily divided into the following categories:

Operator's or Users' Guide - General software procedures
Reference Guide - Indepth explanation of each command available
Installation and Users Guide - Platform specific instructions

Additional manuals are clearly labeled for their purpose including Designers Tutorials and Quick Reference Guides for each product. If there is not a separate Designers Tutorial for a specific product, a bundled tutorial may usually be found within the User's Guide. In this way Oracle ensures adequate documentation is available for both novice users and experienced database developers.

Oracle's hotline support provides a 2 hour response time for each call received. This service is available to all Oracle users with a standard maintenance agreement. For purposes of the bakeoff ISC was given one local point of contact for support. The availability of that individual due to travel and other circumstances should not be confused with Oracles' standard hotline response.

File Structure Data Entry:

ORACLE's key assignments may be confusing to the novice user because of the CTOS/BTOS proprietary keyboard structure. The F1 key, however,

interactively displays all active key assignments for the ORACLE tool being used. The HELP key on the Convergent keyboard may be used for assistance on all ORACLE commands, including instructions on their use. ORACLE also supplies a CRT Form with SQL*Forms which provides keyboard-and screen-attribute mapping capabilities. An explanation of this file and its use may be found in the ORACLE for CTOS/VM Installation and User's Guide.

Report:

Oracle recommends that the Coast Guard try SQL*Plus as an alternative report generation tool to SQL*Report. SQL*Plus provides an interactive interface to the RDBMS as well as additional commands for report formatting and hard copy output. SQL*Plus reporting commands allow users to format columnar data; edit column headings; add titles, sub-titles and footers; summarize data and perform several types of calculations; control page breaks and page size parameters; output each report to the screen, an operating system file, and/or the host printer; store format commands for later execution.

Appendix B: Functional Capabilities Table

Oracle would like to correct and clarify the following capability statements:

Page B-2:   Memory and Disk Requirements

Oracle requires 4 MB Ram and 15MB disk space to operate the RDBMS and all optional tools. Memory requirements for the database engine only are 1704K, SQL*Plus 400K, SQL*Forms 400 to 600K.

Page B-3:   Support 186 NGEN

Oracle supports the 186 NGEN as a database client connected to a 286 or 386 NGEN database server.

Page B-3:   Access Method

Oracle's access method is Ansi Standard SQL. It is not proprietary. Oracle RDBMS software is written in C.

Page B-6: Date (Max Size)

Oracle's default date display is 7 characters long (e.g., 1-Jan-90). Dates may be formatted in several ways, up to and including the full spelling of the month and day, and including the time in hours, minutes and seconds.

Page B-6: System Date (Max Size)

ORACLE's default date format is 7 characters long (e.g., 1-Jan-90). Dates may be formatted in several ways, up to and including the full spelling of the month and day, and including the time in hours, minutes and seconds.

Page B-7: Other Data Field Types

Oracle also supports:

RAW: Binary data or byte strings. Maximum length is 255 characters.

LONG RAW: Binary data equivalent to LONG datatype. Maximum length is 65,535 characters.

ROWID: the logical address of each row in a table.

Page B-26: Other Search parameters

Response should be YES. ORACLE provides several types of search parameters not already mentioned, including a SOUNDEX function which matches the sound of a word.

Page B-29: Exponential Functions

Response should be YES. ORACLE supports exponential functions.

Page B-30: Other Mathematical functions.

Response should be YES. ORACLE provides a wide variety of mathematical functions, including Absolute Values, Greatest and Least comparison, Rounding, To-Number character to numeric value conversion, and Truncation.

Page B-32:   Automatic Macro Recording

Response should be YES.

Page B-32:   Macro Language

Response should be YES.

Page B-34:   Maximum Report Width

Response should be 500.

Page B-38:   Other Output Destination

ORACLE permits direct data output to printer, screen, disk, tape, and to another system in a distributed processing environment.

Page B-42:   Portability to other OS

Other operating systems ORACLE is ported to which were not previously mentioned includes: Xenix, Stratus VOS, Dynix, Banyan Vines, AIX, HP-UX, MPE/XL, Ultrix and UTS.

Page B-42:   Other User Support

ORACLE also provides varying levels of onsite support and extensive user training.

Page B-43:   Interface to other Applications

ORACLE also interfaces with a wide variety to 3rd party packages including other databases, inventory management, law, manufacturing, etc. A VAR (value added reseller) catalog is available upon request.

Page B-44:   Software and Hardware Costs

ORACLE software from Oracle Corporation is not included in the Coast Guards' Standard Terminal Contract. Software availability and pricing from Oracle may differ from that proposed by third party vendors.

UNISYS

Unisys Response to U.S. Coast Guard Database Bakeoff Report

Introduction

The report describes the results of Phase I and II of the Coast Guard's three phased effort to evaluate database products. Phase I focused on the ability of "novice end-users" to perform a wide-range of database activities; testing the evaluators' ability to function in the roles of database administrator, data processing professional and end-user.

Phase II evaluated the ease and effectiveness of porting a portion of an existing application to three database products; PROGRESS, Oracle and Informix-SQL.

This memo represents Unisys' response to those sections of the report which refer to the Unisys Oracle product.

Documentation/Tutorial:

Although, the evaluators felt that the SQL*Plus, SQL*Loader and SQL*Report user documentation was "clearly written," they state that "the number of manuals was confusing at first." The summary on page 3-A-19, reiterates this point stating that there are "too many manuals for the novice."

We agree. On a product-by-product basis, the Oracle documentation is very good. However, Unisys has already identified the need for a single manual that provides first-time users with an overview of the Oracle products and documentation. The BTOS II Oracle Installation and Configuration Guide produced by Unisys is a first step at addressing this requirement.

File Structure/Data Entry:

The key phrases used by the evaluators in the section were "easy
to set up", "not necessary", "done simply" and "very simple".
The evaluators correctly noted that several SQL statements must
be executed in order to drop the definition of a column from a
table.   However, normally you would not expect this procedure to
be executed frequently in a production database.

Although the evaluators felt that the SQL*Forms procedure for
generating a default form was "very simple." They also felt that
"keyboard assignments for both versions (i.e., Unisys and Oracle)
were a bit confusing".   The keyboard assignment in SQL*Forms is
user-configurable. Both Oracle and Unisys provide a default
configuration file. However, the CRT utility can be used to
create a customized configuration file for each individual user.

Data Manipulation:

The evaluators felt that "adding, modifying, or deleting records
in a table was quite easy with SQL*Plus."

Although the evaluators felt that the SQL*Loader documentation
was "written clearly", in this section they state that "importing
an ASCII file was very difficult." On the other hand, the Phase
II evaluator felt that SQL*Loader "worked well and was very easy
to use."

The Phase II comments are consistent with the type of feedback
Unisys has been receiving on SQL*Loader. However, the Phase I
comments indicate that this group of "novice end-users" must have
encountered some type of problem. Since the report gives no
insight into why the evaluators felt the task was difficult, we
will not be able to address their concerns in this response.

Query:

Agreed, "SQL*Plus performs ad-hoc queries quickly and simply."

Report:

We agree that SQL*Report is difficult to use. Oracle Corporation
has developed a new product, SQL*ReportWriter, to address this
weakness in the product line. Unisys plans to release
SQL*ReportWriter with Oracle 6.0.

UNISYS

Performance:

The comments speak for themselves. "Oracle was among the products with the fastest times in the benchmark tests." "Performance was very good."

However as noted by the evaluators, multi-user performance was not addressed. We feel that the omission of these tests represent a high-risk in the selection process. Systems which perform well in a single user environment may not be able to adequately handle a large, real-time, multi-user, production database environment. Oracle was designed to function successfully in this type of environment.

Appendix B - Functional Capabilities Tables:

Both the Oracle Corporation and Unisys versions of the Oracle RDBMS are built on the same baseline (5.1.22). Differences in the response are more indicative of interpretation of the question rather than actual differences in the product.

UNISYS

Summary

The U.S. Coast Guard Database Bakeoff Report is extremely well-
done and represents a critical step in the evaluation process,
focusing on the ability of a DBMS to function in a single-user
environment. But there is a risk that this evaluation may not
provide sufficient information to predict how well these systems
will meet the Coast Guards's data processing requirements for the
1990's.

The following kinds of questions may still need to be answered.
Will the same performance demonstrated in the single-user
environment be maintained in a multi-user environment? Do these
systems meet the Coast Guard's requirments for distributed
database processing? For example, can a single SQL statement be
used to extract data from multi-sites? Do these systems support
full transaction management? For example, do they support
deadlock resolution as well as deadlock detection? Do these
systems meet the Coast Guard's requirement for recovery? How
long will it take the system to recover in case of either
hardware or software failure? If the Coast Guard truly requires
a fully-featured, multi-user, distributed, relational database
management system, then we feel that Oracle is the answer.
We would like to thank the Coast Guard for allowing Unisys to
participate in the Database BakeOff and for sharing the results
of the evaluation.

January 12, 1990

United States Coast Guards
Information Systems Center
7323 Telegraph Road
Alexandria, VA 22310-3999

Attention: J. J. Thrower, Executive Director

Subject: DATABASE BAKEOFF RESPONSE

Dear Mr. Thrower,

First of all, we thank you for your thorough evaluation of PARADISE. We also wish to congratulate you on the unique and extensive comparative study you performed.

We were extremely pleased that the evaluators appreciated PARADISE's user interface and ease of use, since we believe that this is a major strength of our product. At the same time we recognize the relevance of their criticism on several other aspects. The purpose of this brief response is primarily to show you that we have indeed been working on those weeknesses for quite some time. These enhancements will be included in a major new version of PARADISE (version 3.0) to be released in may of 1990.

PARADISE 3.0, while maintaining a superior user interface, enhances those aspects that our users and prospective customers were asking for.

The issue of speed:

• Menu speed:

Your evaluators noted somewhat slow menus when developing with PARADISE. In PARADISE 3.0, all menus are loaded into memory and access to any menu is therefore instantaneous.

• Processing speed:

This is probably the area to which we have brought the most dramatic improvements. For reference, we have performed some of your benchmark tests using our current in-house version of PARADISE 3.0. We chose to run those tests that correspond to the most common use of DBMS products, namely: sorts, selections and reports. The results are enclosed. You will notice that PARADISE 3.0 compares very favorably with (or even surpasses) the fastest products of your benchmark study.

Other enhancements:

These are too numerous to list within this brief note. However we wish to mention the
following new features that were addressed in your study. PARADISE 3.0 will include:

- mouse support;
- descending sorts;
- sort on calculation fields;
- query by example capability;
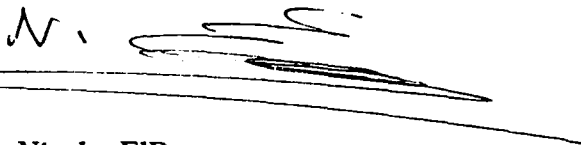
Corrections:

We wish to correct the following errors in your comparative charts:

Page B-2	Memory required:	400K
Page B-4	Fields per database:	30,000
Page B-32	Macro language:	YES

Thank you again for your interest in PARADISE.

Sincerely,

Nicolas ElBaze
President

Enclosures: Benchmark test results for PARADISE 3.0

PARADISE 3.0

	II-A	III-A	III-B	III-C	IV	V-A	TOTAL
500 record master best	6	1	4	3	10	9	33
500 record workstation best	31	1	29	24	32	10	127
5000 record master best	36	1	32	20	61	79	229
5000 record workstation best	275	2	262	158	285	113	1095

500 records

master

best

	II-A	III-A	III-B	III-C	IV	V-A	TOTAL
INFORMIX SQL	52	1	3	4	9	3	72
Oracle(Oracle)	39	1	2	6	7	4	59
Oracle(Unisys)	49	1	2	3	16	3	74
Paradise 3.0	6	1	4	3	10	9	33
PROGRESS	37	1	3	4	10	1	56
R:BASE 5000	33	1	2	19	100	3	158

500 records
workstation
best

	II-A	III-A	III-B	III-C	IV	V-A	TOTAL
INFORMIX SQL	67	1	3	4	10	3	88
Oracle(Oracle)	71	3	4	9	9	4	100
Oracle(Unisys)	68	2	3	3	29	3	108
Paradise 3.0	31	1	29	24	32	10	127
PROGRESS	62	2	6	8	17	5	100
R:BASE 5000	58	1	5	31	201	11	307

5000 records
master
best

	II-A	III-A	III-B	III-C	IV	V-A	TOTAL
INFORMIX SQL	624	1	18	83	76	42	844
Oracle(Oracle)	331	2	16	13	54	31	447
Oracle(Unisys)	495	1	17	15	45	30	603
Paradise 3.0	36	1	32	20	61	79	229
PROGRESS	469	1	77	39	227	15	828
R:BASE 5000	549	1	16	62	990	114	1732

5000 records
workstation
best

	II-A	III-A	III-B	III-C	IV	V-A	TOTAL
INFORMIX SQL	1094	1	20	85	81	49	1330
Oracle(Oracle)	890	4	18	16	57	32	1017
Oracle(Unisys)	666	2	18	16	58	31	791
Paradise 3.0	275	2	262	158	285	113	1095
PROGRESS	901	2	158	79	398	35	1573
R:BASE 5000	1024	2	38	109	2267	233	3673

(THIS PAGE LEFT INTENTIONALLY BLANK)

PARAMETER DRIVEN SOFTWARE, INC.
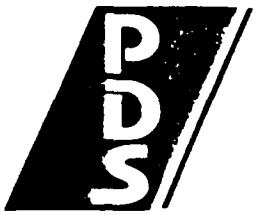
30800 Telegraph Rd
Suite 3820
Birmingham, Michigan 48010
(313) 540-4460
Fax (313) 540 7549

To: USCG Information Systems Center

From: Parameter Driven Software

Subject: Coast Guard Database Bakeoff Report

It was with some reluctance that Parameter Driven Software
participated in the USCG "Bakeoff." However, as a well known and
very successful 4th GL tool, our absence would surely have raised
some eyebrows.

In electing to enter this test we find ourselves in a situation
where our product is asked to perform tasks which by accident or
intent are inevitably designed with a certain bias towards one
product or another.

PDS-ADEPT is an <u>Application Generator</u> used to design and build
sophisticated applications and not just manipulate data bases.
Further, we take advantage of the software tools that are
provided by the hardware manufacturer such as ISAM, Forms Editor,
etc.

It seems to us at PDS that the "Bakeoff" unfortunately evolved
into a test of products using relational data bases being pitted
against those using standard CT-ISAM, yet all of them were asked
to perform tasks favoring a relational data base.

For a number of years we have been expounding upon the idea that
4th GL programs are like tools in a tool box. Every application
has different requirements; particular products serve some
applications well, others not so well.

Probably the most relevant sentence from the "Bakeoff" report is
found on page 3-B-2 and we quote, "Others evaluating the data may
choose to introduce weighting factors to emphasize those tests
that are more important to their needs."

This is the only statement in the report where the authors appear
to realize and state that the tests which were performed might
not be applicable to all the products being tested and to all end
users.

BTOS DATABASE EVALUATION   Page E-29

The evaluation of our documentation has us truly puzzled. If we may point out the qualitative statements both **pro** and **con** from page 3-A-24. Bold type is our own.

1 The tutorials and manuals are **very helpful** in understanding the basics

2 It **stopped short of explaining** operational statements

3 The manuals **explained the statements** (seems to contradict #2)

4 **Not enough examples**

5 PDS-Query comes with a user guide that explains the product **very well**

6 A short Quick Glance section which provided **adequate instructions**

Until we read the very last sentence of the documentation/tutorial evaluation, we thought we were getting good grades.

With regard to the "subjective" evaluations, any report which contains a "subjective" section and then proceeds to "objectize" these personal opinions on bar graphs we find at best misleading.

Our customer support group has files of letters extolling the virtues of our customer support line and we are known throughout the industry for our excellent support. With a 94% user loyalty rate, it is highly unlikely that we would continue to retain our users if we offered the type of support your report suggests. If you need references please call us.

Now, on to the minutiae.

Page 3-A-23. PDS-ADEPT currently supports one main file and 10 secondary files including up to 99 keys open within the 11 files.

Page 3-A-25. There are a number of ways to add a key to a file. The technique described using ISAM reorganize is the most efficient because it uses the least amount of disk space. A much simpler method would be to copy the FD to a different name, add the key, and write a simple ADEPT batch update to read the old file into the new one. This test is one of those which is heavily biased in favor of non-ISAM data bases.

Page 3-A-25. Creating a report identifier requires 8 screens of fill in the blanks, not 6. Your reviewer was only off by 25% apparently in our favor. What was not mentioned however was that for standard simple reports like those on the test, 4 of the 8 screens require NO response and could have been skipped with a simple keystroke, and 1 screen requires only 1 response -- giving the report a title.

Page 3-B-3. Test V-C-2 is another seemingly simple test which has a major bias towards relational data bases and against ISAM. The "technique" that we employed was to design the data base correctly from the start, anticipating the need for additional fields. The field could be added quickly while its data entry position and screen position were easily designated using program logic.

To remove the field, the logic and field were simply removed from the program requiring NO CHANGE to the file structure itself and NO PROCESSING TIME. Batch updates could easily have been written to create new ISAM files with and without the required new field, but because of a good data base design, this was totally unnecessary.

Everyone knows that ISAM data store files are fixed structures once created. The test seemed to be designed to favor those who don't use ISAM. Our solution elegantly dealt with this fact. For this we were awarded 10,000 points and a bar graph that stretched across the page.

PDS would be happy to design a more practical test such as developing a general accounting package, a police department package, a ski resort reservations package, or a public radio station membership pledge system. Of course, all these things have been done in PDS-ADEPT already and they demonstrate the depth and breadth of our product.

In summary, the USCG is to be commended for its ambitious attempt to try to make sense of the 4th GL maze of products. But it is our opinion that the playing field was not entirely level and that the inclusion of the "subjective" section based on the opinion of one or two people and/or one or two phone calls was ill advised.

(THIS PAGE LEFT INTENTIONALLY BLANK)

PROGRESS
SOFTWARE

January 15, 1990

Mr. J. J. Thrower, Executive Director
U. S. Coast Guard
Information Systems Center
7323 Telegraph Road
Alexandria, VA 22310-3999

Dear Mr. Thrower:

Progress Software Corporation (PSC) is pleased to provide the attached comments concerning the draft copy of the Coast Guard Database Bakeoff as requested in your letter of December 13, 1989.

PSC also submits the following "administrative" requests for your consideration and inclusion in the final report:

(1)   In addition to listing the DEVELOPER and OEM/VAR address and phone number, please include the address and phone number for the FEDERAL CONTACT for each product. For PSC please include:

> Progress Software Corporation
> 1655 North Fort Myer Drive
> Suite 700
> Arlington, VA 22209-3108
> (703) 276-0515

(2)   Please include the Version and/or Release identification for each product. For PROGRESS, the proper identification is:

> Version 5.2

PSC appreciates the time and effort which has been invested by Government personnel in completing such a thorough review of all the software packages available for the BTOS operating system environment. Thank you for including the PROGRESS family of products in the Bakeoff. Please contact me if you have any questions regarding this response or any other PROGRESS or PSC matters.

Sincerely,

Brian L. Astle
Director, Federal Marketing

Enclosures: (1) Response To The Coast Guard Bakeoff Report - 12/13/89
            (2) Response on Diskette in ASCII and WordPerfect Formats

Introduction

Progress Software Corporation (PSC) thanks the U. S. Coast Guard for including PROGRESS in the Database Bakeoff. PSC appreciates the time and effort which Government personnel invested in the Bakeoff. PSC feels that the evaluation was very well thought out and complete. The results reinforce PSC's belief that PROGRESS is easy to use <u>and</u> provides the necessary tools to develop complete applications. Unless otherwise noted, all references to PROGRESS pertain to Version 5.2 of the software. Please direct any questions regarding this response to Brian L. Astle at (703) 276-0515.

Documentation

On page 3-A-28 of the report, the evaluators comment that "there is no indication where to begin" with the PROGRESS documentation set. This is incorrect. The Test Drive manual, which is an introduction to the PROGRESS Application Development System, outlines the contents of each manual and which to read first. PSC also includes a "READ ME FIRST" pamphlet reviewing the same information. Each manual also includes a preface outlining its specific purpose and audience. In this fashion, a user can pick up any book, and by scanning the introduction understand what the volume contains. Since PROGRESS is used by developers and end-users alike, each can choose to proceed in whatever manner they wish.

Again on page 3-A-28 of the report, the evaluation team mentions that PROGRESS lacks a cross-reference index for the entire set of manuals. This is incorrect. The documentation set contains a PROGRESS Pocket Reference Guide which outlines the syntax for all the valid PROGRESS commands. This Pocket Guide <u>also includes a cross-referenced index</u> of the entire documentation set by topic. PSC's documentation is comprised of a total of 11 manuals - 9 PROGRESS 4GL and 2 FAST TRACK books - not 10 as the report states on page 3-A-28. Perhaps the PROGRESS Pocket Reference Guide was overlooked or mislaid.

PSC believes that PROGRESS documentation is among the best reference material available. In addition to awards in the past, the Society for Technical Communications, a technical writing consortium, has just awarded PSC the 1989-1990 STC Award For Excellence for PSC's current documentation.

Report

The evaluation team comments that PROGRESS FAST TRACK Report Writer was somewhat cumbersome and tedious on pages 3-A-29 & 3-A-30. The Report Writer is a menu driven interface to allow users to develop any type of report desired by painting the format and then inserting the data into the report with a WYSIWYG (What-You-See-Is-What-You-Get) method. On the average, our users recount two-table reports generated in 10 keystrokes - very efficient in PSC's opinion. True, the PROGRESS 4GL does allow reports to be written succinctly in very few lines of code, and with little or no programming experience. But

FAST TRACK is aimed at users with no programming background who do not wish to type in code of any sort. With this in mind, PSC feels that the PROGRESS FAST TRACK product more that meets these people's needs.

Performance

In general, PSC feels that the performance numbers included in the benchmark results were representative of the PROGRESS product. The tests were somewhat skewed where cluster station timings were involved (Graph III page 3-B-7); PSC's timings for 50 and 500 record databases were linear, while the 5000 record database timings were slightly higher. PSC had requested a 150K database buffer cache despite the fact that more resources were available. With 250 byte records, some simple arithmetic proves that PROGRESS was able to cache the 50 & 500 record databases, while the 5000 record database required buffer paging. Had a larger database buffer cache been used, linear results would have been produced. While taking over all of available memory on the master station would have provided linear times for all three database sizes, this would not reflect a "real world" configuration in the BTOS community. With a BTOS master usually configured with between 2 and 4 Meg of memory, a PROGRESS server with 150K of buffer space runs extremely efficiently for all size databases. This leaves enough room for all the system services and other BTOS utilities, plus RAM for several BTOS programs to be run. Other database vendors new to the BTOS marketplace require <u>at least 3 Meg of memory</u> dedicated to their product's servers - a very large cost for a very small performance benefit.

Features List

PSC would like to point out several items in the features list comparison which could cause confusion.

On page B-7 under the Data Field Types (Max Sizes), the maximum size of a Boolean expression is listed as 32,767. In fact, a PROGRESS logical value only requires 1 byte of disk space for storage. In PROGRESS, a boolean value can be formatted to look like any 2 logical values - "male/female", "here/there", "yes/no" - but only one byte per record is stored in the database file. This keeps data storage requirements low. PROGRESS disk requirements are lowered even further because of the variable length storage feature of the DBMS. Only the data entered by the user is stored in the database; fields are not padded with trailing spaces as with ISAM-based products.

On page B-15, under the heading of "Data Manipulation", PROGRESS' ability to Allow Foreign Index is listed as NOT SURE. PROGRESS allows users to define one primary index and up to 1023 secondary (a.k.a. "foreign") index structures per table. Therefore, the column entry should read YES.

Page B-17 states that PROGRESS cannot do unions and intersections. This is incorrect. While the PROGRESS syntax does not include the words "UNION" and "INTERSECT", both actions can be easily accomplished in the 4GL. The ANSI standard for SQL does not include the concept of INTERSECT. Therefore, the two column entries should read YES.

On page B-18, under the heading of "Data Manipulation", the PROGRESS limits for Maximum # Tables Per Join, Union, and Intersection are listed as 127. In fact, PROGRESS allows up to 1023 tables to be manipulated in any fashion. Therefore, these three entries should read 1023.

Page B-19 continues the "Data Manipulation" section and lists PROGRESS' Maximum # Append Tables as NOT SURE. The entry should be 1023.

Future Directions

PSC is proud to have been selected the 4GL and database product included in the standard Coast Guard bundle, as well as being singled out as "the DBMS of choice for the majority of future Coast Guard development efforts" in this report (page D-2). And things will only get better. The next Coast Guard bundle will include Version 5.2 of PROGRESS. Version 5.2 includes ANSI standard SQL, a PROGRESS procedure library of often-requested user routines, database access from Pascal, C, and Cobol (via SQL), and numerous performance enhancements. Version 5 also allows users to connect ASCII terminals to the master station (either directly or via modem) to allow multiple users to run on the same machine, further enhancing the multi-tasking capabilities of BTOS/CTOS. This ASCII terminal connection capability was implemented as a result of a specific request from the Coast Guard.

Of course PSC is not a company to stand still. Version 6 of PROGRESS is on the way! It is already in beta test. When and if the Coast Guard implements Version 6, Coast Guard users will find even more exciting enhancements in this release, with support for distributed databases. This will allow users on a local cluster to work with their own database and connect to other machines running other PROGRESS databases to allow users to better share and manage information. All this while guaranteeing the integrity of the data with a true two-phase commit architecture, which makes sure any transaction which affects multiple databases will complete correctly or be backed out. A new dictionary interface to manage this multidatabase environment has been written with pull down menus and pop-up windows, so even with this new architecture, maintaining PROGRESS databases is still an intuitive menu driven process. Several new 4GL language features and a utility which speeds up data loads by at least four times make Version 6 of PROGRESS the most powerful yet. A review of the "BTOS relevant" contents of PROGRESS Version 6 is located on pages 5 and 6 of this response.

Besides Version 6, additional end-user tools to allow even easier query and report access to PROGRESS databases are also being evaluated and designed. While PROGRESS continues to be a complete application development environment, PSC recognizes the need for a toolset which can be used as a standalone tool or integrated into an existing application which provides an intuitive end-user database interface. PSC personnel will be pleased to demonstrate these new interfaces as they become available.

Summary

PSC feels that the evaluation team has done a very fine job reviewing PROGRESS and other products from an end-user standpoint. PSC was most pleased that only one product - PROGRESS - finished in the top grouping of all categories rated. PROGRESS was able to attain these consistently high ratings only by incorporating all of the following product features in a single cohesive system -

o Standard SQL & Procedural Fourth Generation Language

o Non-procedural Menu-driven Toolset

o High Performance Non-ISAM Based Database Engine

o Efficient Memory Utilization

o Complete Application Portability To Over 160 Environments

o BTOS Availability Of Entire PROGRESS Product Line

The acceptance of PROGRESS in Coast Guard installations everywhere has been truly gratifying. PSC will continue to support and enhance the product, asking for Coast Guard input all along the way.

The information presented herein is based on the most current plans available as of this date. The extent to which PROGRESS is actually implemented on BTOS is dependent upon the capabilities of the total computer system (hardware/operating-system/network) and any relevant contractual terms and conditions. The detailed implementation of Version 6 may be slightly different than the details presented here for planning purposes.

New Functionality

Distributed Database Support

- The ability to dynamically connect and disconnect to up to 240 databases simultaneously. These databases can either be local or connected remotely via a networked environment. Each PROGRESS client now has multiple protocol support (TCP/IP, Netbios, DECNET, SPX, etc.) to allow connectivity between databases residing on different machines running different communication interfaces.
- Full access (read, write, delete) to all connected databases is supported, although a local database can now be opened read-only if desired for WORM drive and CD ROM support.
- In order to guarantee data integrity when updates across databases occur, a two-phase commit architecture has been implemented.

Foreign Database Support

- In addition to allowing multiple PROGRESS databases to be opened simultaneously, foreign data structures can also be manipulated using PROGRESS Version 6. The first 2 databases to be supported are ORACLE and DEC'S RMS, with DEC'S RDB to follow shortly. PROGRESS allows complete transparent access to these structures (read, write, delete). In the case of file structures, such as RMS, PROGRESS has the added benefit of supplying transaction undo capabilities.

New Data Dictionary

- The data dictionary has been completely redesigned for PROGRESS Version 6. This new interface employs a pull-down menuing system, allowing easier manipulation of data elements as well as distributed and foreign databases. Many new utilities have been also included. Default Form, View, and Record Copy generators, a Global Field Rename utility, and automatic SQL DDL (Data Definition Language) generation for any table or view will make managing the new Version 6 architecture much easier.

- A new Parameter File Editor has also been built to allow menu-driven entry of PROGRESS start-up and tuning parameters. Also new with Version 6, all database startup parameters can be stored together in a "parameter file", which can be recalled and re-edited.

- Export capabilities for WORDPERFECT, WORDSTAR, Microsoft Word, and BTOS word processors have been added to assist in building Mail Merge lists for mass mailings.

Bulk Loader Utility

- A new utility has been included which takes a PROGRESS-readable ASCII file and automatically stores the information in the database, bypassing the 4GL front-end. For large loads of data, the performance improvement is at least three times faster than previous versions.

2048 Concurrent Users/Transactions

- The maximum number of simultaneous users/transactions per database has been increased to 2048, up from 256 in previous PROGRESS versions. Each user can connect to up to 240 databases at the same time.

32 Character Identifiers

- Field names, file names, and variables have been extended from the current length of 12 characters to a maximum of 32 characters.

Optional Case Sensitivity

- With Version 6 of PROGRESS, you now have the option to create case sensitive fields and variables.

Dynamic Procedure Nesting

- The number of levels procedures can be nested has now been made a tunable parameter, to support even the most recursive, complex applications.

Upward and Downward Compatibility

- PROGRESS Version 6 includes a CONV56 <u>and</u> a CONV65 conversion utility for supporting the conversion of Version 5 and Version 6 databases both ways.

<u>New Statements & Functions</u>

New Functions For Multi-database Programming:

- CONNECT - Connect a database
- CONNECTED - Is a particular database connected?
- DISCONNECT - Disconnect a database
- CREATE and DELETE ALIAS - Manage logical names for databases
- DBIMS - Which foreign db interface modules are present?
- DBRESTRICTIONS - Returns a list of unsupported functions for a particular foreign database.
- DBTYPE - Returns what kind of database a db is (PROGRESS, ORACLE, RMS)
- DBVERSION - What version of a particular db are you accessing?
- LDBNAME - Returns the logical name of a database
- NUM-DBS - Returns the number of dbs connected
- PDBNAME - Returns the physical name of a database
- SDBNAME - Returns the name of the database containing the schema definitions for a foreign db

Other New Statements

- IMPORT - Read a line from an input file into a record or variable without using a frame (Input file can be a maximum of 32,000 characters).
- SEEK - Positions the file pointer at a particular offset in an ASCII file
- PROPATH - Set the PROGRESS 4GL search path from within the 4GL
- EXCEPT - Show all fields in a record EXCEPT the fields listed

Other New Functions

- DEBLANK - Removes leading and trailing blanks from a string
- FRAME-DB - Returns the database name of the field the cursor was last positioned in
- FRAME-NAME - Returns the name of the frame being accessed
- FRAME-INDEX - Which array element in a form is the cursor in?
- IS-ATTR-SPACE - Is the current terminal type space-taking?
- NUM-ENTRIES - Returns the number of items in a list of strings
- PROGRAM-NAME - What is the name of the calling procedure?
- PROPATH - Return the current PROGRESS search path
- R-INDEX - Returns a position of one character expression in another
- SEEK - Returns current position of the file pointer in an ASCII file

(THIS PAGE LEFT INTENTIONALLY BLANK)

🔟 MICRORIM®

January 30, 1990

Lt. Jon Allen
U.S. Department of Transportation
United States Coast Guard
Information Systems Center
7323 Telegraph Road
Alexandria, VA 22310-3999

Dear Lt. Allen,

Microrim would like to submit the following comments in
response to the review of its relational database management
system "R:BASE 5000 CTOS" in the Coast Guard Database Bakeoff
Report.

We would like to begin by thanking the Coast Guard for the
opportunity to participate in the Database Bakeoff. We feel
the review of Rbase 5000 was thoroughly and fairly prepared.
Microrim is extremely pleased with the high ratings we
received on our R:BASE 5000 Database Management System. The
Database Bakeoff Report demonstrates that a database can be
both easy and powerful at the same time. R:BASE 5000 achieved
a rating head and shoulders above the rest in ease-of-use,
never receiving less than a 4 rating on a 1-5 scale in any of
the five categories. In fact, R:BASE rated a top score of 5
in the EASE and DOCUMENTATION categories. In the performance
ratings, R:BASE 5000 consistently rated in the top 5 out of
the 12 competitors.

In response to the summary statements on R:BASE 5000,
Microrim, of course, agrees with the strong points
identified: excellent documentation, simple ad hoc queries,
menu driven report generation, and easy structure setup with
Application Express. In fact, R:BASE was the first DBMS to
offer an application generator that generated code without
programming - Application Express. Application Express is
great as a prototyping tool for advanced application
developers, for users who don't know how to program, and for
developers just getting started.

Regarding the only two weak points that were identified:
Microrim has provided an easy to implement workaround for the
bug found in reports. The second - some command memorization
required - is not much of a weak point by the report's own
admission in their summary paragraph "The documentation
presents these simple commands so clearly, however, that a
novice should have no trouble with this product. One
evaluator was able to perform all of the tests without
hotline assistance."

Another point in R:BASE's favor is its foundation. R:BASE is based on the relational database RIM, developed by Boeing in the 1970's for mainframe use. The founder of Microrim, Wayne Erickson, and the VP of Development, Dennis Comfort, were part of the original RIM development team. R:BASE, therefore, has its roots in relational database management - it has a data dictionary and its relations are part of the database engine. Many other database management systems require programming in the relationality which puts data integrity at risk.

In reference to Microrim's support of R:BASE 5000 CTOS, we continue to provide workarounds and bug fix releases for R:BASE 5000 CTOS. We will continue to evaluate the CTOS/BTOS market for additional enhancements to R:BASE; however, Microrim has not announced any specific future releases at this time.

An additional benefit is R:BASE 5000's competitive licensing policy. The package is both single user and multi user. The license allows an unlimited number of users per server. In the larger CTOS configurations R:BASE is extremely cost effective.

In reference to Microrim's current and future product releases we are shipping R:BASE for DOS, version 2.11 currently and will be shipping a new version of R:BASE for DOS, version 3.0, at the end of March 1990. These DOS based products can be executed under the DOS Emulation Mode on the CTOS equipment. In addition, programs and data written under R:BASE 5000 CTOS can be converted to an ASCII format that is readable by these DOS packages. This is done by converting the R:BASE 5000 CTOS files using the CTOS MS WRITE function. Some modification of the applications may be necessary to take advantage of the additional power the DOS packages offer.

The DOS based products were first released in 1983, and currently have the second largest installed base of any PC DBMS. R:BASE for DOS, version 2.11, has been in the commercial market place for over two years. This package offers a wide array of features capitalizing on Ease of Use and Power. The new release, R:BASE 3.0, establishes the new standard for ease of using a PC-based relational database management system and can effectively be used by the first time database management system user.

R:BASE 3.0's attractiveness to end users stems from a newly designed visual, pull-down menu interface. It enables the user to access all the essential DBMS functionality -setting up a database, looking at and manipulating information, and

building forms, reports and applications - from the main menu. This ensures the user is not faced with hunting for functionality buried deep in the interface. The pull-down menu interface includes menus that cascade, prompting through dialog boxes, and information lines on the bottom of the screen to give constant feedback to the user. This visual roadmap for managing data always lets the user know where they've been, where they are and what their next options are. And R:BASE 3.0 is specifically designed to minimize the number of keystrokes to get results. One keystroke from the main menu, and the user is looking at their data.

In addition to its emphasis on ease-of-use, R:BASE 3.0 is the only PC DBMS to offer 100% fully-integrated ANSI Level 2 SQL with DB2 extensions in 640K. That's fully integrated, not a shell. SQL is now a fundamental part of the command language. To the end user, it's transparent. To the developer, full SQL is a welcome addition in querying power and flexibility. For example, the enhanced SELECT command and Rules with full SQL clauses give the developer much more power.

R:BASE 3.0 is a strong developer's tool as well as an easy-to-use end user product. Developers are able to create powerful forms with multitable referential integrity. Popup windows and entry/exit procedures enable the developer to create applications that, for example, will automatically reorder units when your inventory hits the minimum quantity. Application Express, R:BASE's powerful application generator that creates applications without programming, empowers developers with the ability to create applications with the same pull-down menus and popup windows that R:BASE uses.

Plus there are such user convenience features as autonumbering rows without programming, automatic print styles from over 100 printers, a fully integrated query /browse menu that allows users to look at, change, and ask questions of data all from a single menu, and Query-By-Example (QBE).

Whether you are an end user looking for a simple DBMS to help you manage your daily information tasks, and application developer creating complex applications for users, or an MIS/DP manager trying to satisfy both groups and establish certain standards in their organization, R:BASE 3.0 has the history, the support and the features and benefits that you need.

Microrim's product line migration does not stop at the micro level. Microrim's VANGUARD is the first complete DBMS solution for enterprise-wide data sharing. Based on client/server technology, VANGUARD will include a number of

software product per platform to provide flexible DBMS
solutions for users of standalone PC's and workstations,
workgroup users, as well as many thousands of users connected
to LAN's.

VANGUARD's key differentiator is adopting almost identical
graphical user interfaces no matter what platform the user is
on. This means a user on a Sun machines can create a form,
and a user on a Macintosh, if given security release, can
access and modify that same form. VANGUARD's graphical user
interface (GUI) engine insures this transparent access to
DBMS functionality across platforms.

The VANGUARD family of products will be developed for IBM
OS/2 Presentation Manager and future versions of Microsoft
Windows; DEC VAX/VMS; leading UNIX versions, including AT&T -
Sun standard UNIX, IBM AIX and DEC ULTRIX; and Apple
Macintosh to support multi-platform interoperability.

VANGUARD is intended to work in an organization's existing
environment. Organizations have spent a great deal of money
investing in their current hardware and software and should
not be expected to abandon it for new technology. VANGUARD
enables you to continue to use your Oracle DBMS on your VAX.
But with VANGUARD, you will be able to access your data
within your Oracle database thru your MacIntosh or Sun
workstation etc...

VANGUARD's first release is scheduled for Fall, 1990.

Microrim hopes that this information will give the Coast
Guard community a clear picture of the current offering in
the R:BASE product line; as well as Microrim's future
offerings. Once again we thank the Coast Guard for allowing
us to participate in the Database Bakeoff. We look forward
to working with the Coast Guard Community in the future.
Microrim feels strongly that it's R:BASE for CTOS, as well as
its DOS based products, can help the Coast Guard accomplish
their mission quickly, easily and efficiently. We also feel
that our future products can help the Coast Guard remain the
technology leaders that they are today.

If you have any questions regarding this information please
feel free to contact me at 703-532-4700.

Sincerely,

Wendy M.Rieger
Federal Sales Manager